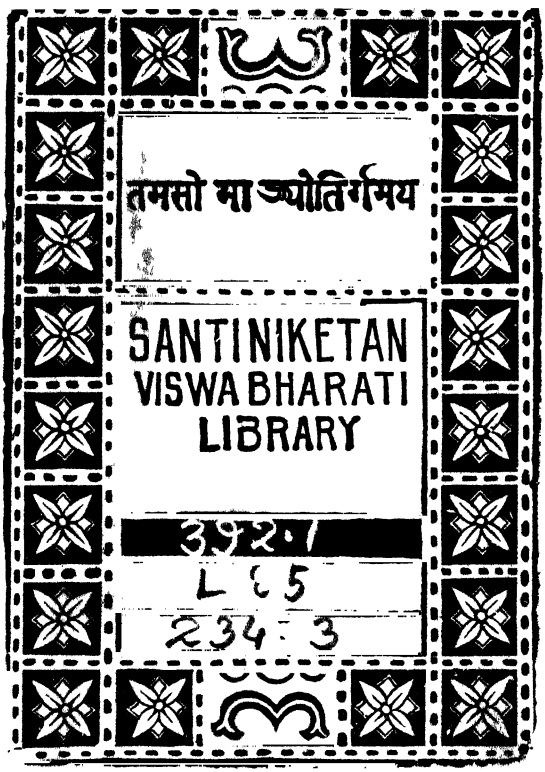
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OLD CHIPPED STONES

OF INDIA

FOUNDED ON

THE COLLECTION IN THE CALCUTTA MUSEUM

BY

A. C. LOGAN, I.C.S.,

MEMBER OF THE ASIATIC SOCIETY OF BENGAL, AND OF THE ROYAL ASIATIC SOCIETY AND ANTHROPOLOGICAL SOCIETY OF BOMBAY

CALCUTTA

THACKER, SPINK AND CO

1906

CALCUTTA :

PRINTED BY THACKER, SPINK AND CO.

PREFACE.

THE stone implements of the Calcutta Museum are at present in the unhappy position of being nobody's child. As a stage, possibly, of their progress from the geologists who collected them to the archæologists who ought to know all about them, they are resting in the custody of the zoological department. Moreover, whether owing to dislocations produced by the necessity of finding room for the exhibits of the Victoria Memorial Hall or some other cause, the greater part of them have parted company with their fellows still on view in the Museum, and are huddled in confusion in a cabinet in the zoological office. These circumstances increased the trouble of studying them, and would indeed have rendered study impossible had Lieut.-Col. Alcock, C.I.E., who has charge of them, not kindly given me every facility for the purpose and allowed me to work in his library. I must also express my obligations to Mr. Holland, Director of the Geological Survey, for help in various ways, and to Mr. Garrick of his office for kindly taking the photographs which have been used to illustrate the book.

ABBREVIATIONS USED.

Mem. G. S.	... Memoirs of the Geological Survey of India.
Rec. G. S.	... Records of the Geological Survey of India.
Proc. A. S. B.	... Proceedings of the Asiatic Society of Bengal.
Journ. A. S. B.	... Journals of the Asiatic Society of Bengal.
Rep. Arch. Surv.	... Reports of the Archæological Survey of India.

OLD CHIPPED STONES OF INDIA.

CHAPTER I.

INTRODUCTORY.

THE cabinets of the Calcutta Museum, and others in the library of the Natural History Department of the Government of India, contain many hundreds of chipped stone implements found in India. Most of them were discovered by the officers of the Geological Survey of India, and some by those of the Archæological Department in General Cunningham's time and by other observers. The largest finds were made between 40 and 30 years ago; but a good donation came in 1902 from the Collector of Cuddapah. In the Museum no history of the stones exists beyond a register in which they have been numbered and entered as they were received; but accounts of the discoveries made by the officers of the Geological Survey were usually, though not always, given in the Records and Memoirs of the department, and these discoveries, together with those of other persons, were not unfrequently made the subject of papers read before the scientific societies of Calcutta and other Presidency towns. Of some no account can be traced. As regards any general treatment of the subject, a paper showing the distribution of stone implements in India as then known was read in 1878 before the Royal Irish Academy by Mr. V. Ball of the Geological Survey, and brief notices of the earlier discoveries were given by Evans* and Boyd Dawkins† in

* Ancient Stone Implements, p. 570.

† Early Man in Britain, p. 166.

their works. The subject, therefore, is not entirely an unworked one: but it appears to deserve much fuller treatment than it has hitherto received, not only in elucidation of what has already been done, but for the encouragement of further research. There is ample room for the latter. The field of discovery is almost entirely unworked as regards deposits in caves, and in the matter of implements in gravels or on the surface much may yet be done, not merely in finding stones, but in describing the geology of the scene of discovery and noting any indications of age given by the position of the stones in the soil. There are, indeed, in India few persons with leisure to devote themselves systematically to this interesting and historically invaluable pursuit: but every district under British administration contains some Europeans to whom opportunities of discovery might occur if their attention were drawn to the matter, and their interest excited by the knowledge of what has hitherto been discovered, and of the conclusions to be drawn from the discoveries.

The areas in which chipped implements, from quartzites 8 or 9 inches long to agates of an inch or two, have been collected, comprise almost every part of the Indian Empire. Most of the larger stones come from the Kistna, Nellore, Arcot, Chingleput, Tanjore, Madura, Cuddapah, Karnul and Bellary districts of the Madras Presidency, and from Belgaum, Dharwar and Bijapur in the Southern Maratha country of Bombay; and the bulk of these were contributed by Mr. R. Bruce Foote, late of the Geological Survey, who was not only the pioneer of this branch of discovery in India, but also the most vigorous worker in it. The first chipped implement ever found in the country was picked up by Mr. Foote on May 30th, 1863, at Pallaveram, near Madras, during the survey of that region; and thereafter to the end of his service few localities surveyed by him failed to yield some tribute of palæolithic or neolithic objects. Dr. King of the

Survey was also a noted worker in the Madras field. Elsewhere the discoveries, except as regards surface flakes, have been on a smaller scale; but implements have been found in the gravels of the Godavari, Nerbudda, Jumna and other rivers, and in various places in the Nizam's Dominions, the Central Provinces, Berar, Central India, Bundelkhand, Rajputana, Sind, the Punjab, Bengal, Orissa and Burma. These discoveries are chiefly associated with the names of Messrs. Ball, Blanford, Oldham, Hughes, Wilson and Hackett of the Geological Survey; but a good collection from Marpha in Bundelkhand and other places was made by General Cunningham, and the names of Messrs. Rivett-Carnac and Cockburn, and of Colonel Oakes, Major Abbott and Lieutenant Swiney, may be enumerated in connexion with the discovery of surface flakes. It is not to be understood, however, that all, or even the greater number of the implements collected by these observers, have found their way to the Museum.*

The implements have been found in all sorts of situations; but may generally be reduced under three categories, *viz.*, finds in or in association with the lateritic formations of the Coromandel coast, finds similarly associated with the high-level shingles, gravels and other formations connected with rivers or ancient lakes, and surface finds which do not appear to have weathered out of any old formation. All these last would have been treated by Evans as neolithic, and probably most of them are: but some appear to belong to an intermediate period.

The word palæolith has hitherto been used to cover all implements of the period preceding the ground and polished axes and other tools of the neolithic age. But this period includes implements of two radically different types: those of the river drifts or gravels, and those of the caves. The former are ordinarily heavy and somewhat clumsy stones,

* See Appendix.

chipped evidently for use in the hand as tools: the latter are for the most part lighter stones artistically chipped, and often intended to be the heads of weapons, while in the later stages of this age bone predominates over stone. Owing to the absence of any extensive excavation of caves in India, implements whether of stone or bone resembling those of the cave period of Europe are scanty; and the Indian palæoliths which are in the Calcutta and British Museums, are almost confined to the earlier or river drift type. Clumsy and shapeless as these stones appear to the casual observer, they exhibit certain definite shapes which will be fully described in a later chapter, but may here briefly be said to be disks, ovals, pointed ovals and broad choppers. These stones form a group with resemblances that mark them off from the shapeless things called eoliths, and from the creations of the cave and neolithic periods as a distinct and homogeneous family. Now this family is by no means universal, but on the contrary has a restricted and curious distribution over parts of three continents only. It prevails plentifully in England (but not in Scotland or Ireland), Belgium, France and the Spanish peninsula, while occasional examples have been reported from Central Europe, Russia and Greece. Examples are next found sparingly in Egypt, more plentifully in Somaliland, and again sparingly in the Transvaal and Cape Colony. They are next and finally encountered in India, where they range from Rajputana to Madura, an area not inferior to their main range in Europe. Throughout these regions the type is identical and unmistakeable; though the chopper shape, common to India and Africa, is only known in Europe from one alleged Spanish example. The fact that the area of this family is so restricted and does not in general coincide with the regions inhabited by the races of the most primitive appearance, seems to dispose at once of any theory that the implements were the work of the earliest ancestors of humanity before they had differentiated into races, or that

they are a type which all races would produce in a certain stage of progress. It is incredible that the earliest human beings should have distributed themselves as these stones are distributed, and then at some later date when the style had gone out of fashion, have dispersed over the rest of the world. The facts seem on the contrary to indicate that the implements of the river drift type were the work of one section of humanity after differentiation had made great progress, and that that section did not include the ancestors of the black, red or yellow races. The stones obviously gain a great accession of interest and importance when looked at in this way, and a field for further research and speculation is at once marked off from the chaos in which the whole subject now seems to lie. Volumes have been written in English and French on the stones of western Europe, yet it appears to be regarded as still disputable whether the river drift or cave implements are the older, and it is difficult to find any established conclusions as to the relations of the authors of either with the neolithic men or with the races of our own day. The method adopted has ordinarily been to confine attention in the main to the geological relations of the stones in Europe, neglecting those of other continents or merely paying them the compliment of a passing allusion. In the dearth of definite results from this method the question arises whether new ground should not now be broken, and the different classes of stones studied in their distribution over the earth no less than under it. For this purpose the first essential is of course such information regarding foreign stones as scientific men require. This so far as India is concerned, exists to some extent, scattered over the multitude of reports and papers already referred to; but these are accessible to few in or out of the country, and remarkable as it may appear, although India possesses an even greater range of chipped implements than western Europe, it has not produced one general work on the subject

to set against the library devoted to the question in that continent. It is my object to make a beginning, however humble, in this direction. The first thing necessary is to clear away any possible suspicion that may exist, that the Indian stones identical in type with the river drift implements of Europe belong to a time so much more recent than the age of the latter that they cannot be connected with the same race; but must be supposed to have arisen spontaneously among another generation of men.* I accordingly propose in the next following chapters to deal as fully as the recorded accounts allow with the geological formations in or on which the Indian implements have been found. Even at the risk of being tedious it is necessary to bring out the point that whenever competent observers have recorded the relevant facts, it is found that in every locality in which chipped implements of the oldest forms occur there are recent formations of soil, etc., whose creation requires years counted in tens of thousands, with which the stones are *not* associated; and on the other hand formations of much greater antiquity with which the stones are in certain or apparent association. It is true that the most of the stones have been found on or very near the surface; but this is no argument against antiquity when the surface in question is not the top of a recent formation but the bottom of an ancient one worn away by denudation. Moreover, since nature cannot give false evidence, the discovery of even one or two implements firmly embedded in undisturbed gravels or rocks of ascertained antiquity establishes the case for those stones, and gives a powerful inference as regards the rest. More than one or two such discoveries have been made, and if they do not compare in number with those of Europe it is probably due merely to

* "Outside Europe finds in Egypt, Somaliland, Cape Colony and Madras and certain other localities still give rise to controversy, and their palæolithic age is by no means fully established." Br. Mus. Guide, p. 6.

the fact that while there are scores of people in England and France ready to explore the bowels of the earth on the chance of finding an implement, there are extremely few people in India whose leisure allows or interest prompts them to do more than pick up a stone which they happen to see at their feet.

I begin with the Madras coast in which the first and most fully recorded discoveries were made ; but without any implication that the implements of the laterite are the oldest. My opinion indeed, as will be seen subsequently, is that the laterite of the Coromandel coast closed the geological period with which the stones are chiefly connected, and the presumption would therefore be that the implements found in it are on the whole later than those found in association with formations attributable to an earlier stage of the period. But as a general caution it may be noted that superior antiquity in the origin of one formation is no proof of the superior antiquity of all the stones in it over all of those belonging to a formation of later origin. Formations may overlap in age, and the palæolithic men did not cease living or necessarily migrate when a geological stage reached its termination, so that stones dropped on the surface of very ancient gravels which had long ceased to grow may be younger than others embedded in a formation which began later than the beginning but not than the end of the gravels.

CHAPTER II.

THE COAST SYSTEM.

Godavari, Kistna, Nellore, Chingleput, Arcot, Pondicherry, Cuddalore, Tanjore, Madura, Tinnevelli, Eastern districts; Travancore, Ratnagiri, Western.

GENERAL FEATURES OF COAST.

STARTING near the Godavari a range of quartzite hills of pre-cambrian age runs some 250 miles south to Tripetty, at a distance of 50 or 60 miles from the east coast to which it presents a vertical scarp. To the west, inland, the formation has a great extension, covering the Cuddapah and Karnul districts to a width of nearly 100 miles, while south of Tripetty outlying masses of it occur with a progressive approximation to the sea, as far as or a little beyond Madras. These hills are all included in the loose geographical name of the Eastern Ghats; but the main range north of Tripetty, which rises to heights of 2,000 feet, is specially known as the Nallamalai and Vellikonda hills. The formation, known geologically as the Cuddapah series, is important, not only as the boundary of the coast system in its northern half, but also as the source of the quartzites from which the palæolithic implements of Southern India were usually fashioned. It appears that in Mesozoic times the range formed the shore of a jurassic sea. South of Madras the Eastern Ghats which continue the ancient shore-line are of gneissic formation, and jurassic strata appear to give place to cretaceous; so that the Mesozoic depression of the coast may not have been simultaneous in both quarters; but since upper Tertiary times at any rate the history of the whole coast on both sides, from the Godavari to Cape Comorin

and thence to Ratnagiri, appears to have been practically identical. This is inferred from the uniformity of the geological features. From the foot of the ancient shore-line, often marked by immense masses of shingle or other debris, a basin of gneiss 150 feet or more above sea-level, broken up by hills of all altitudes but generally low, extends 40 or 50 miles towards the sea, succeeded by a low flat-topped range of what are called Cuddalore sandstones or grits, often resting on much-denuded jurassic or cretaceous strata. This range or plateau which varies in height from 250 feet to three or four, is almost invariably overlaid by a formation of sedimentary or detrital laterite, which graduates from a conglomerate of shingle or pebbles to one of gravel and sand as it approaches the sea and sinks below the later alluvium. Laterite shingle and gravel are also common in the gneissic uplands behind, often at altitudes of many hundred feet. A peculiar feature of the Cuddalore formation is that for a great part if not the whole of its range it has a scarp towards the land and a gentle slope towards the sea. Beyond it is the coast alluvium, usually not more than 8 or 10 miles wide, which often ends in hills of blown sand. Since the chipped stones of the coast are usually found in intimate association with the laterite, it is essential that the origin and age of the formation should be ascertained, and with a view to this the geology of the several districts concerned will be examined in some detail. There has not hitherto been complete agreement among the geologists over the Cuddalores and the laterite. The former have gradually been brought down from eocene to pliocene, with a suggestion of possibly pleistocene age ; and it does not appear to be yet certain whether they are of marine or fresh-water formation. As regards the overlying laterite, which is of course younger, it is agreed to be a washed-down or reconstituted formation due to the mixing of shingle and gravel with ferruginous matter derived from the iron-clay which forms by decomposition of gneiss

and trap; but there has been a difference of opinion whether the mixing was done by fresh or salt water. The theory which I venture to broach on the subject will appear in Chapter VI, and in the meantime I pass to a detailed description of the lie of the land.

GODAVARI DISTRICT.

The Cuddalores originate at Samalcottah in the Godavari district, and have there a development which is hardly paralleled in any other part of their long range. The strata here are 308 feet thick and sometimes rise 250 feet above sea-level. They are notably ferruginous and in some places are worked for iron. The vast delta of the Godavari which, like all the other rivers of the coast, cuts through the Cuddalores, has apparently covered or carried away the post-Cuddalore lateritic conglomerates and gravels, and no palæoliths are recorded from this district. It was, however, well within the sphere of the palæolithic men, who have left their traces in the gravels of the river higher up, and stones may yet be found if carefully sought in places where the laterite crops up. In the Kistna and North Nellore districts immediately below palæolithic stones abound, and I pass to the description of this region.

KISTNA and NORTH NELLORE.*

The region extends from the Kistna to Ramiapatanam, a little south of the Maneru, and has a nearly uniform width of 56 miles from the sea to the Nallamalai and Vellikonda hills. About 40 miles of this width are occupied by the gneissic belt, which is wild country under the Vellikondas, and is everywhere hilly: some of the heights in the Kondavida hills on the eastern edge of the gneiss rising to nearly 1,700 feet. Strata rich in hæmatite and magnetic iron abound, and patches of laterite gravels and shingle are common. At the edge of the gneiss is a fringe of

* Mem. Geol. Surv. XVI.

jurassic strata, and over and all round these are lateritic formations, widely developed in the south where they almost reach the sea, but less conspicuous in the north where the delta of the Kistna has no doubt obliterated them. These formations are conglomerates, gravels and sands varying in thickness from a few feet to thirty, and sometimes resting on white conglomerates. Except at Ippatam, Mr. Foote who surveyed this region does not appear to recognise the existence of the Cuddalores at all: but Dr. King who surveyed the adjoining area to the south is of opinion that the strata, however thin, underlying the laterite "skin," are identical with the Cuddalore formations of the Godavari district; and he must be right, since these reappear as a plateau 40—70 feet high south of the Maneru. Beyond the laterite beds, where these do not reach the sea, come the fluviatile and marine alluvia of the coast: the former comprising the delta of the Kistna and the deposits of the Gundlakumma, Mushi, Paleru and Maneru rivers, and the latter occupying a belt on the shore 3 or 4 miles wide. Blown sands occur from the edge of the water to many miles inland, some of them forming ridges several miles long, composed of tolerably compact masses of red sand bound with clay.

Chipped quartzite implements have been found in every part of this region, ordinarily in positions which associate them with the age of the superficial laterite deposits. Some were found in the laterite fringing the Cuddalore conglomerate at Ippatam, 50 miles up the Kistna where the delta begins; others at Kandakur and elsewhere in lateritic gravels on the coast, and others, both implements and flakes of poor construction, in laterite conglomerate much mixed with quartz at Potelur near the sea, south of the Maneru. But a still greater number were found in the gneissic belt to the north and south of the Maneru and its tributaries, from Velegunla to Pamur and Kothapalle, 44 miles inland on the south bank, and from Lingasamudram at the edge of the gneiss on the north bank

to Ramiapalle under the Vellikondas. All these implements were found in more or less close association with shingle or lateritic gravel older than the recent alluvium of the rivers, the shingle being often of a very coarse character and not always ferruginous. Thus implements were found at Angalur, just below the quartzite hills in a calcareous shingle of quartz and gneiss. The implements of the region were of varying degrees of excellence, and good and bad were often found together. It is in no case stated whether they were extracted from the beds or found on the surface; but no stone was found except in the immediate vicinity of these ancient deposits and a sufficient number have been found deeply embedded in the laterite in other districts to place the association in age beyond dispute

SOUTH NELLORE.[*]

The Nellore district from the Maneru to the Pulicat Lake has much the same character as the last, except that the Cuddalore formation is much more conspicuously seen, though not approaching the thicknesses of the Godavari section. This and the gneiss belt are much covered with detrital laterite, and laterite caps believed by Dr. King who surveyed the region to be of purely aerial origin, by decomposition of the gneiss, are found on some of the heights The chief river of the region is the Penner, the existing delta of which is considered far too small for the size of the river. It is suggested that both this river and the Palar, which once flowed north of Madras, had formerly much more extensive deltas, between which the Pulicat Lake lay as a hollow not reached by the respective deposits. Certain shoals over five miles out at sea appear to indicate the extension of the land at this time. All this creation and subsequent destruction of land has taken place since the epoch of the laterite. No implements are recorded from this region, which was surveyed before the existence of

[*] Mem. G S., Vol. XVI.

palæoliths in India had been realised ; but it is no doubt at well stocked as the region just described to the north, or that to the south to which I now come.

CHINGLEPUT and ARCOT.*

The alluvial plain on which the city of Madras stands is comprised in the Chingleput district, and the N. and S. Arcot districts lie inland from it. The quartzite range, now becoming much broken up, no longer constitutes a solid background for the coast region, but forms detached masses, 30 to 50 miles from the sea, in the northern part of Arcot, where they have the name of the Nagari Hills. From this point southwards the background is almost purely of gneiss, which stretches without a break across the peninsula. On the eastern edge of the gneiss in the north of Arcot stand the low Sattavedu and Alikur Hills of jurassic age, with the loftier Nagari Hills not far behind them. All round and behind these hills and piled up against the foot of the Nagari Hills at heights of 500 feet, are masses of conglomerate and shingle, more or less lateritic. The Cuddalore grits appear to the east in Chingleput at a distance of 12 miles or less from the shore, and are seen as broken bits of plateau with a landward scarp, sometimes 50 feet high, showing white strata below and a thick laterite cap above. From these caps laterite conglomerates, gravels and sands, extremely coarse on the landward side, overspread all levels till they sink below the alluvium. Further south the coarse grits in the neighbourhood of Conjeeveram, appear to be a continuation of the Cuddalore system. The history of the later fluviatile alluvium of this region is interesting. There are three principal streams: the Narnaveram which flows into the sea a little south of the Pulicat Lake, the Corteliar (with its tributary, the Nagari, flowing from the north) which reaches the sea north of Madras, and the Palar which trends

* Rec. G. S., Vol. XII, Mem. Vol. X.

southward from Conjeeveram and reaches the sea 44 miles south of Madras. It appears, however, that originally the Nagari flowed into the Narnaveram, and the Palar into the sea north of Madras: both rivers having been deflected southward by human agency which cut new paths for them through strips of gneiss. During their earlier existence these rivers had overlaid the lateritic formations with at least 13 feet of alluvium to a width in places of six miles, which has since been cut through again. The diversion of the Palar which must have been earlier than that of the Nagari (since the Corteliar could not exist till the Palar was diverted), may be attributed to the Pandyans, or perhaps to that ancient civilisation preceding them of which traces remain in buried cities and cemeteries from Pallaveram to Tinnevelli.

Palæolithic quartzite implements have been found in numbers in this region, both on the coast and on the gneissic uplands. The first implement ever discovered by Mr. Foote, as mentioned above, was dug out of a ballast pit of laterite gravel near Pallaveram; but the largest number of implements found near the sea were dug out of laterite beds in the Attrampakam nullah near the Corteliar, where they were overlaid by 10—12 feet of soil and clays. Some of these were on the surface of the laterite or in the clay a few inches above it: but many others both here and in other localities, were firmly embedded in the conglomerate and could only be extracted by hammer or chisel. Implements were also found at Caradeputur in lateritised quartzite conglomerate, at Amerumbode in laterite clay, at Cunnambakam in conglomerate and near Manjakaranei apparently in the laterite cap of the cliff. The implements were stained the same colour as the pebbles of the conglomerates, and there is no doubt but that both got into the beds at the same time. Messrs. Oldham and King regard the laterite beds of the Attrampakam nullah and other low ground as washed down from, and therefore later than, the laterite caps of the Red Hills and

other plateaus, and this is no doubt the case; but Mr. Foote states that he chiselled several instruments out of the laterite capping the grit cliffs overhanging the Corteliar; and this being so, it is clear that the implements in the nullahs might be as old as the caps, and might have come into the nullahs with the debris from them. But the point is of little importance as regards the general age of the stones; for the laterite of the nullahs was unquestionably deposited before the recent alluvium, and Oldham's view simply prolongs the duration of the laterite epoch without bringing its termination any nearer to our own time. Its effect is rather to throw back the age of the caps, and of the stones still sticking in them, by whatever period is necessary for the subsequent denudation into the nullahs, and if the stones in the latter were dropped while the laterite was forming there, to add so much to the era during which the stone chippers flourished. Implements were also found in situ in high level beds at Cunjalam and Chungonum, where the laterite is described as identical in character and relative position with that of the Red Hills. In the gneissic uplands implements were found at Naikenpolliam near the Alikur Hills, about 500 feet above sea-level, on the weathered surface of laterite conglomerate, and at Roodrar, Kirkambadi, Arkonam and Vanimbadi far inland at lesser heights among laterite debris. The existence of vast shingle banks of quartzite pebbles round the southern flank of the Nagari Hills and round the Sattavedu and Alikur Hills at heights ranging up to 500 feet, led Mr. Foote to surmise that in recent times the land was depressed to this extent, and a shallow sea covered the present coast, studded with islands between which currents flowed with great rapidity. He believed that the laterite of all levels was formed beneath this sea, and that the makers of the implements lost them from boats. He was led to the boat theory by the fact that while some of the implements are much water-worn, others and sometimes those found close

to the present seashore, are practically unworn. The opinion of other geologists, however, does not incline to the theory of so great a subsidence of the land in recent times, and if the presence of the sea cannot be invoked to explain the existence of palæoliths in laterite at all heights, it may not be necessary to invoke it at all. My own theory will, however, be deferred until all the localities in which palæoliths are found have been described.

PONDICHERRY and CUDDALORE.*

Between Madras and the Cauvery palæoliths have not been reported. In this region the Cuddalores are represented by the red sandstones of the Red Hills of Pondicherry and the Capper Hills of Cuddalore. At Trivicary in this region the formation contains beds of fossil wood, which however do not suffice to settle its age. The old alluvium denuded from the Cuddalores here has been bored to a depth of 550 feet before reaching the base, and at the middle depth contains a bed of lignite 35 feet thick. Mr. Medlicott† was of opinion that the presence of vegetable remains in these deposits, which are very ferruginous, indicated a gradual passage of the land through densely wooded swamps to the sea, an opinion which may be contrasted with that of Mr. Foote, and compared with that of Dr. King‡ that in the laterite period of the Nellore district the land was covered with water and jungle like the south coast of Ceylon, where laterite locally known as "cabook" is now forming under atmospheric exposure.

TANJORE, MADURA and TINNEVELLI§.

Between the Cauvery and Cape Comorin lie the districts of Tanjore, Madura and Tinnevelli, and chipped instruments have been found in the two first. The gneissic upland which as usual below Madras forms the background of the

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* Rec. G. S Vol. XIII

† Ditto, Vol. XIV.

‡ Mem. G. S., Vol. XVI.

§ Rec. G. S., Vol. XII, Mem. Vol. XX.

region, does not reach within 70 miles of the shore in Tanjore: but in Tinnevelli, owing to the inward curve of the Gulf of Manar, comes down nearly to its edge. In Madura ridges of a granular quartzose rock of metamorphic character, not to be confounded with the Cuddapah quartzites now left a long way to the north, occur among the gneiss south and a little north of the Vaigah River as the Nagamalai and Allagiri hills, and afforded material for the implements of the palæolithic men. At the edge of the gneiss the Cuddalore sandstones and the overlying lateritic formations are profusely seen in Tanjore and Madura, and in the former district almost reach the sea; in Tinnevelli, however, both formations practically disappear between the Vaipar and Nambiar rivers, the sandstones, however, reappearing south of the Nambiar about 20 miles north of Cape Comorin in the form of white grits of a few feet in thickness, identical with the Warkilli Hills of Travancore on the other side, and overlaid by a calcareous sandstone containing marine fossils of existing species. The laterite reappears in this quarter not overlying the sandstones, but scattered over the gneissic rocks in their rear. In the marine sandstones therefore, we appear to get a formation which is more recent than the laterite, and their great extension indicates the length or the period which has elapsed since the latter. They exist as a fringe to the coast on both sides of the Ramnad Peninsula in Madura, and on Rameshwaram Island beyond the Pamben Channel, and are said to constitute the ridge which under the name of Adam's Bridge divides Palk's Bay from the Gulf of Manar and stretches to Ceylon. A coral reef high and dry on Rameshwaram proves a comparatively recent upheaval of the coast here, which Mr. Foote believes united Ceylon with the mainland in times late enough to have come within the purview of tradition. The rupture of communication since then has been due less to subsidence than to the breaching of the causeway by waves: the last breach, indeed, which created the

Pamben Channel is a historical event dated 1480 of our era. The sandstones are found again at the mouth of the Gundar where the Gulf of Manar begins its great curve southward, and at many places on the Tinnevelli Coast, but most plentifully in the extreme south. They everywhere abound in shells of existing species, and at Kudangkulam near Cape Comorin pass into limestone, which there has an elevation of 159 feet with a southern scarp. Outliers of the marine rocks found at various places in Tinnevelli indicate that they once had an altitude of at least 200 feet, from which they have been reduced to their present small thicknesses by denudation. Dr. King regards them as blown sands indurated by infiltration of water; but it is not clear how those in Palk's Bay can have been formed in this way, and the Cape Comorin limestone certainly requires deep water. In the northern end of the region large apparently artificial flakes of chert have been extracted by hammer from the laterite conglomerate between Tanjore and Vellam. The material of these implements appears to have been derived from certain chert rocks in the neighbourhood. Specimens of a coarse quartzose stone, resembling chipped implements, are common in the conglomerates and gravels of the gneissic belt in this quarter, and an undoubted "broad axe-head" of the same stone was found near Shuragudi in the north of Madura. At Tallekulam on the gneiss near Madura 64 miles inland chipped scrapers and knives of brown and grey chert not belonging to the region have been found on a mass of gneissic shingle cemented by laterite, and other flakes of the same material, one of which is said to have resembled an arrow head and was probably a borer, have been found in rain gullies on the laterite overspreading the Cuddalore plateau at Mana-Madura and Pikulam 20 miles to the south and 36 miles from the sea. Similar flakes have been found in quartzose shingle and gravel more or less cemented by laterite on the gneiss near the Pallache Lake

towards the southern boundary of the Madura district. At this point laterite formations practically cease and with them the discovery of implements. Yellow gravels and shingles often forming taluses at the foot of the hills take their place in Tinnevelli, and are thought by Mr. Foote to represent the Conjeeveram gravels of Madras, and to have been formed under the sea or in a great lake.

The quartzose implements have evidently been fashioned from the rock of the Nagamalai and Allagiri hills, and with the Vellam chert implements are no doubt very ancient. Those of foreign chert may be later, but as they are not in the Calcutta Museum, I can offer no opinion derived from their shapes.

The region should not be quitted without notice of the "teris" or red sandhills which form so conspicuous a feature of Tinnevelli coast scenery, but are not much seen elsewhere except in Nellore and Travancore. These great mounds of blown sand, which are usually compact and support palms and other vegetation, sometimes reach elevations of 200 feet or more and may cover 20 square miles of ground. At Taruvai and some other places near the sea they have caused the formation of freshwater lakes by blocking the drainage. On loam exposed by the removal of about 16 feet of a teri a few miles north of the Tambraparni River in South Tinnevelli flakes and cores of foreign red chert, similar to some found in Jabalpur in North India, and flakes of quartz were found together with burnt pottery. This find, though neolithic, is interesting since the place is near the heart of an ancient civilisation well acquainted with iron and other metals which has left over a score of buried cities and cemeteries along the banks of the Tambraparni. These people had the strange custom of interring skeletons in jars and then apparently removing the dried skulls and some of the bones to wear as mourning; a custom which survives (without the jars) in the Andaman Islands, but had apparently disappeared

from usage in India before historical times. Their age therefore must be anterior to that of the Brahminised Pandyans who held this region in the first millenium before our era, and since the red chert flakes must be older still, an age of several thousand years is indicated for the sand hill.

TRAVANCORE and RATNAGIRI.*

Palæolithic implements have not been recorded from the Malabar Coast, and these districts are only mentioned because they reveal formations, called in Travancore the Warkillis, which are considered to be the equivalents of the Cuddalores, and an even more conspicuous display of overlying laterite. The Warkilli beds contain at their base great quantities of wood, sometimes the common blackwood of the country, which is no more altered than Irish bog-oak, a fact which militates against their having a greater antiquity than late pliocene. If, as the geologists hold, the Warkillis were contemporaneous with the Cuddalores, this fact is of importance to my theory, which requires a comparatively late date for the latter. In Ratnagiri the Cuddalores are only represented by a thin white clay, overlaid by thick laterite. This laterite was almost certainly formed under the sea, and the total absence of implements from the district, though stone chippers lived not far inland at the south end is to some extent unfavourable to the theory that the implement bearing laterite of the Coromandel was formed under sea. But it is not strong evidence, for the greater part of the district is bordered by a region of trap, and the old palæolithic men seem to have had an aversion for that formation. They were therefore probably seen but rarely on the shore of the sea which then washed the Western Ghâts, and there was little chance of their implements being swept into it.

The intervening districts have not been surveyed.

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* Rec, G. S., Vol. XV.

CHAPTER III.

SHINGLES, GRAVELS AND TALUSES OF THE INTERIOR.

Belgaum, Dharwar, Bijapur, Bellary, Karnul, Cuddapah districts, Godavari, Nerbudda, Jamna, Sabarmati, Indus rivers—Lower Bengal, Orissa, Central India, Rajputana, Bundelkhand, Burma.

BELGAUM, DHARWAR and BIJAPUR.*

DIVIDED by the Western Ghâts from the coast, the Southern Maratha country contains the boundary line where the gneiss of Madras meets the trap of Bombay; and it shows palæoliths running up to the boundary but not passing it. It is full of laterite and since it has certainly never been under the sea since the trap was poured out in cretaceous times, it affords an example of extensive accumulations of sedimentary or detrital laterite under purely freshwater conditions.

The trap covers all the northern and much of the western part of the region; but south of the Kistna (here called more correctly the Krishna), there are extensive exposures of quartzite and limestone hills of the vastly older Cuddapah series, through which the Gatparba and Malparba rivers flow eastward with occasional falls, one of which at Gokak is renowned for its beauty. These join the Kistna on the Nizam's frontier, where the trap is succeeded by the gneiss, and 90 miles further east the Kistna is joined by its great affluent the Bhima. Implements are found as far east as this.

On the evidence of great taluses, shingles and banks which exist in various situations, the region between, and south of, the Gatparba and Malparba rivers is believed by Mr. Foote, who surveyed the country, to have contained several ancient

* Mem., G. S., Vol. XII.

BELLARY.*

South of this region and divided from it only by the Tungabhadra, lies the district of Bellary, which has yielded good store of both chipped and neolithic stones to many collectors, though the former, as will be suggested later on, are probably not of the earliest period. The base rock of the region is gneiss: but it is crossed by many belts of what is called the Dharwar series (older even than the Cuddapahs), a formation of schists, hornblendes and hæmatites which yielded no convenient quartzites to the stone-chippers, but plenty of jaspers. The Sandur and Copper hills near Bellary and the Kumarswami hills to the south-west belong to this formation. The summits of the Bellary hills are sometimes capped by massive laterite, and their feet are covered by enormous masses of talus, sometimes cemented by laterite into a breccia. There are no traces of ancient lakes of any size, unless certain laterite terraces abutting on the Kumaraswami hills are lacustrine, but there is evidence in the shape of high-level gravels that the Tungabhadra once flooded a much wider area than at present. These gravels, which are often well-rolled shingle of quartz and gneiss pebbles, are well developed on the right bank of the river above the Sandur hills, which once formed a barrier across the bed, and attain in places a height of 100 feet above present flood level. At Nittur on the north bank an oval quartzite implement was found on the surface of such gravel, showing that the quartzite men of Dharwar ranged as far as the Tungabhadra, though they probably did not cross it. Of contemporary age with these gravels, according to Mr. Foote, are the great deposits of coarse and fine debris which spread like fans round the flanks of the Sugalamma or Copper mountain and many other hills. These are supposed to have been formed when the debris blocked the drainage channels and forced the flood waters to flow back towards the hills

* Mem., G. S., Vol. XXV.

from which they had descended. Numbers of chipped implements have been found among these talus fans, some being turned up by the plough where the talus is covered by soil. All the implements found in the taluses were of hæmatite jasper. It appears that they showed some of the Madras shapes, but were generally of smaller size. None of them seem to have found their way to the museum, and I am therefore unable to offer an opinion whether they belong to the same age and race as the quartzites. Another of the same material was found on a ledge on the side of a hill.

The neolithic folk also had settlements at many places in this district, particularly on the Sugalamma and Kapgal hills, and implements, ornaments and images of every variety of stone, local and foreign, are found with red and black glazed pottery on the sites.

KARNUL.*

To the east of Bellary lies the Karnul district, interesting on account of its caves which will be described in the next chapter. Quartzite implements of the Madras pattern were found at Roodrar and Madaipur in this district in association with the ancient gravels of the Khander river, and often in situ. Fragments of chert resembling artificial flakes were also found in the beds of streams. The quartzite and chert implements, if the latter are authentic, probably belong to different periods, and the cherts may perhaps be associated with the cave implements.

CUDDAPAH.

The Cuddapah district lies between Karnul and Nellore, and the discovery of stones in it completes the belt across the peninsula from Dharwar to Nellore. I learn from information kindly supplied by the Collector of the district that the collection in the library of the Zoological Department was made by a former Collector, Mr. Macleod, who trained one of his peons to the

* Proc., A. S. B., 1867.

work. The British Museum also contains a collection by this officer. The stones were picked up from the surface "in hills, maidans and scrub jungle," at the following among other places: Kanamalopalle, the Pullampet taluka *passim*, Chitvel and Kalasapad. I mention these places in case any geologist passing that way cares to look into the matter, for without an accurate geological description of the localities, the stones lose half their value. Presumably they have been weathered out of taluses or old gravels, for they are mostly though not always, of archaic type. The material is usually quartzite, as might be expected, seeing that this district is, so to speak, the home of the formation. Some quartzite implements had previously been found at Rachoti in this district by Mr. Foote,* and they are so generally common as sometimes to be used for railway ballast. It would seem that Cuddapah was an important centre in palæolithic times, as Bellary subsequently was for the neolithic men.

HIGH-LEVEL GRAVELS OF THE GODAVARI.

I now pass to the valley of the Godavari, which, rising in the Western Ghâts beyond Nasik, flows through the north of Hyderabad and with its tributary, the Wardha forms, as it curves southward, the boundary between that State and the Central Provinces. Near Paithan on the upper waters of the Godavari, Mr. Wynne† found an agate flake in or on a bed of calcareous conglomerate in the cliff, 30 feet from its summit and 20 from the base. Bones of Elephas nomadicus, now lost, are believed to have been taken from this stratum in 1888. Naturally fractured agates abound in it, but there appears to be no doubt that the flake in question was artificial, though I have not been able to trace it in the Museum, where it is entered in the register as number 55. I shall have more to say of this flake hereafter. Many other

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* Mem., E. S., Vol. XVIII.

† Rec., G. S., Vol. I.

discoveries have been made lower down in the region from Berar southward to below Sironcha, where the Penganga and Wainganga rivers join the Wardha, and the latter joins the Godavari. In this region the rivers named have cut their way through pre-cambrian and mesozoic rocks (Cuddapahs and Gondwanas), flanked on each side by gneiss: they are, however, ancient rivers and now flow in wide sandy beds (with occasional bars) bordered by broad alluvial flats. Below Badrachalam, about 120 miles from its mouth, the Godavari enters a narrow gorge in which the water may be penned up to a height of 100 feet in flood time, and this causes floods of 40 to 60 feet in the region above. The country on both sides of the rivers is very hilly, and the peaks of the Albaka range on the east rise to 3,000 feet.

The deposits of the rivers fall into two classes: the recent alluvium and the old gravels. The recent alluvium of the Wardha and Godavari, laid down in quiet succession, as shown by the regular lamination, since the rivers have been flowing without disturbance in their present courses, is often 50—70 feet thick and of great width. The deposits are alternately dark and light clays with rich black soil on the top. Although there is nothing surprising in such an alluvium on rivers which rise 60 feet in flood, yet it obviously must have taken no little time for the rivers first to create it and then cut through it again. Beyond the date when the first stratum of this alluvium was laid there is evidence of a time when the rivers from causes which will be described in Chapter VI, aided perhaps by the height of the rock barriers, burst in raging floods from many points and heaped shingle and gravel, torn with the trees growing on it from the hills of the neighbourhood, over a wide extent of country. These ancient deposits consist of clays, gravels and shingle consolidated into calcareous and lateritic conglomerates with little stratification. They are full of completely petrified trunks of trees sometimes 15 feet long, which from their position in

the deposits and loss of branches, were certainly brought down by violent water and did not grow where they lie. Similar accumulations of petrified wood found on the Irrawadi in Pegu have been classed as pliocene on the strength of the fossils accompanying them:* but on the analogy of the Nerbudda beds the Godavari gravels are regarded as pleistocene. Whatever their age man was contemporary with them; for chipped implements have been found in association with them. Some were picked up at Shirpur and Ankora, 20 miles west of the Wardha, and the gravels out of which they appeared to have weathered were derived from Deccan trap, of which the nearest outliers are several miles further west. This gives an idea of the extent of the ancient floods, while the fact that quartzite implements, or any other implements of unquestionably great age have not been reported west of this point, seems to show that here as in the Southern Maratha country, the men of the earliest period stopped at the edge of the trap country. A number of other quartzite implements were found by Mr. W. T. Blanford† at Edlabad on the Penganga, at Chanda between the Wardha and Wainganga, and at Maledi and Chinoor at the Warda-Godavari junction and were presumably derived from similar gravels, though this is not expressly stated. Two apparently artificial flint implements were found somewhere near the Penganga by Mr. Fedden.‡ No palæolithic implements were found in the recent alluvium; but a neolithic axe-head found in the south of the region by Dr. King "not in association with the old gravels" must be associated with it. Forty miles west of Bhadrachalam Blanford discovered 70 chipped implements of white veined quartz in a

* *Vide* Oldham, Rec. G. S., Vol. IV, p. 79. But the idea that these gravels are pliocene has since been abandoned. They are now regarded as late pleistocene.

† Proc., A. S. B., 1867.

‡ *Ibid*.

space 50 yards square of sandstone rock in the recesses of a dense forest. The material is apparently the same as that of the Jheriah implements mentioned below, and a Kaladgi example (No. 206 of the museum). The situation of the find suggests a factory or hiding place of comparatively recent time.

NERBUDDA VALLEY.*

The Nerbudda Valley from the marble rocks at Jabalpur to the gorge at Hoshangabad, a length of nearly two hundred miles, is a rock basin lying between the Vindhyans on the north and the Mahadevas on the south, both of old sandstone formation. Owing probably to subsidence of the land, the Nerbudda in ancient times filled this basin to a height of at least 500 feet, but probably much more, with coarse gravels and clays, which like those of the Godavari are characterised by much false bedding, showing violent floods, and also like them have become cemented by lime into hard conglomerate. Since then the river has cut down through a part of these deposits, and now runs 80 to 100 feet below the great plateau of its own making on either side. The cliffs of this plateau have yielded fossils of mingled species, living and extinct; among the latter Ursus nomadicus, a Euelephas probably identical with E. antiquus of Europe, two species of Stegodon, Rhinoceras n., Equus n. and Sus giganteus (both Siwalik species), Hippopotamus palæindicus, two species of Bos, and Portax, a sort of nilghai. Falconer and Thomas Oldham held that there was a regular progress from the Siwalik fauna to that of the Nerbudda, and as the Siwaliks were then considered miocene, classed the latter as pliocene. Mr. Medlicott,† with apparently better reason, was of opinion that there is a considerable geological interval between the two formations and their faunas (though undoubtedly some

* Rec., G. S., Vols. IV, VI.

† Rec., G. S., Vol. VI.

Siwalik types persisted in the latter, as might have been expected in the absence of a glacial period to exterminate them), and the Siwaliks being now classed as pliocene, estimated the age of the Nerbudda gravels as late pleistocene, equivalent to the post-glacial ossiferous gravels of Europe. Evidence of human existence during the formation of these deposits is not plentiful, but is nevertheless decisive. A symmetrical oval chipped implement of Vindhyan sandstone was found by Mr. Hackett at Bhutra, lying flat and partly buried in reddish clay 6 feet above the base of the cliff and 90 or 100 feet below the top.* The strata above for 20 feet were full of bones. Two other stones were found by the same observer on the surface of the gravels, and from a remark of Mr. Medlicott, who describes Hackett's discovery,† it appears that these implements are common along the northern side of the valley, where they were no doubt manufactured from the Vindhyan rocks. In this area, but beyond the reach of the old gravels, Mr. Wilson found quartzite implements at Saugor and Damoh and at other places in Bundelkhand, lying exposed on the trap, or under the soil covering it,‡ and implements of Vindhyan sandstone from the same localities are numerous.§ A chipped and very heavy implement of magnetic iron stone, containing 60 per cent. of iron, was also found somewhere in the Nerbudda Valley by prospectors, and its character was only discovered when it was sent to be tested for the metal.‖ It may be added that the Asiatic Society of Bengal once possessed a human skull, now lost, which appears to have been taken from the ossiferous gravels of this river.¶ Although

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* Fig. 2, postea.

† Rec., G. S., Vol. VI.

‡ Proc., A. S. B., 1867.

§ See Appendix.

‖ Proc., A. S. B., 1880, p. 120.

¶ Rec., G. S., Vol. XIV.

the Godavari itself has yielded few satisfactory fossils, the discovery of Hippopotamus p., Bos n. and Portax in the gravels of its tributary the Penganga indicate a contemporary age for them and the Nerbudda, and Mr. Medlicott is inclined to ascribe the same age to the lateritic deposits of the coast.

OTHER RIVERS.

The gravels of the Jamna contain much the same fossils as those of the Nerbudda, and are no doubt of the same age. Mr. Cockburn of the Opium Department, collected the bones of several extinct species in these gravels at Hinavti in the Banda district,* and found some chert and quartzite implements in association with the bones of a small horse, specifically undeterminable. I have not been able to trace any detailed account of this discovery; but writing in 1894 of the discovery of a neolithic cemetery at Kon in the Mirzapur district, Mr. Cockburn remarks that certain ovate and discoidal cherts found there were not distinguishable from those of Hinavti.† In the absence of certainty that the strata at Hinavti had not been disturbed, and that the horse was pleistocene, some doubt must remain whether the implements are really as old as supposed. It would seem as if Mr. Cockburn had hit on the grave in which some neolithic warrior, or his ashes, had been buried with his steed and the usual offering of stone implements.

It is incidentally mentioned by Mr. Foote in his memoir on the Bellary district,‡ that quartzite implements of the Madras type had been found at the bottom of gravels 60 feet thick on the Sabarmati river in Ahmedabad, and that in the same locality neolithic objects had been found on the surface of recent alluvium which had formed to a thickness of 80 to 150 feet since the age of the gravels. Mr. Foote relied on this

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* Rec. G. S., Vol. XV.

† Journ. A. S. B., 1894, p. 21.

‡ Mem. G. S., Vol. XXV.

to prove the occurrence of a great gap between the palæolithic and neolithic ages in India, in opposition apparently to a theory which had been broached by Mr. Ball in 1878, that the two periods were contemporary in South and North India, respectively. Mr. Ball's theory never had anything to rest on except his ignorance that neoliths are common in South, and palæoliths in North India; but although there is undoubtedly a vast interval of time between the oldest chipped implements and ground celts, there is no reason to suppose, that there was ever a break in the chain of humanity, and the discoveries at the Karnul caves suggest that the intermediate period was characterised by types resembling those of the cave age of Europe.

An implement of limestone has been found near Attock on the Indus,* and another in the Hazara country, † and flakes and cores of flint have been found on the hills at Sukhur and Rohri and in the banks and bed of the river in the same neighbourhood.‡ Dr. Blanford, who examined them, considered the flakes of the hills older than the cores of the river which are beautifully cut and evidently neolithic. Most of these flakes and cores are in the British Museum, and their appearance confirms Blanford's view. The limestones I regard as early neolithic.

LOWER BENGAL.

At Jherria and Govindpur§ between the Damodar and Barakhar rivers, a few chipped implements of green and micaceous quartzite were found by Messrs. Ball and Hughes in apparent association with taluses of pebbles derived from the Gondwana rocks of the region, from which also the material of the implements seems to have been obtained. A more

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* Rec., G. S., Vol. XIII.

† Proc., A. S. B., 1880, p. 175.

‡ Mem., G. S., Vol. XVII.

§ Proc., A. S. B., 1865, p. 127.

symmetrical implement than the above was found at Gopinathpur* in the Manbhum district on the surface, and another at Raniganj† in Burdwan. Apparently there was no association between the implements and the recent alluvium of the Ganges.

ORISSA.

To the north of the Mahanadi‡ a few oval and pointed chipped implements were found by Mr. Ball at Dhenkanal, Angul, Talchir and Sambalpur. That found at Dhenkanal was of a granular quartzite and the rest of a vitreous quartzite, apparently derived from veins in the rocks of the region. The Dhenkanal stone was found in laterite debris, and may perhaps claim the same antiquity as the stones of the Madras coast. The others were found on the surface, and no clue is given to their association.

CENTRAL INDIA, RAJPUTANA, BUNDELKHAND.

The Museum contains a number of stones of shapes graduating from palæolithic to something like neolithic from various localities in North India. Such are stones of a material resembling quartzite from Neemuch in Central India, from Jaipur, Rintamber, Bundi and other places in Rajputana and from Bundelkhand; while from Marpha in the Banda district of the United Provinces, there is a large collection of implements of trap. There are also trap stones from Damoh. The trap implements have frequently a very rude appearance, no doubt due to the unhappy material; for the shapes usually have a more modern aspect than those of the other stones. There is nothing accessible to me on record to show whether all or any of these stones were found in connexion with formations out of which they might have weathered, or are purely surface finds. They may belong

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* Proc. A. S. B., 1867, p.143.

† Proc. A. S. B., 1870, p.268.

‡ Proc. A. S. B., 1876, p.122.

to both categories if they cover a long period of time; but I put them all here for convenience.

BURMA.

About 1893, Dr. Noëtling,* of the geological survey, discovered a number of small chipped flints on the slope of a ravine in Yenangyoung on the Irrawadi, apparently associated with ferruginous strata containing the remains of Hippopotamus, antelopinum and Rhinoceros perimense, and underlying other strata 4,600 feet thick. The flints as figured by Dr. Noëtling (I have not traced the originals), appear certainly artificial and intended chiefly as knives or scrapers and borers, while some are triangular. They are not essentially dissimilar from some of the smaller flakes figured by Evans and Dawkins from the cave deposits of England; but at the same time they are not essentially different from late surface flakes. The thickness and fossils of the strata in connexion with which they were found point to a pliocene or very early pleistocene age; and the assured association of the flakes with the strata would not only carry the age of man beyond anything that has yet been established, but would show him as then in a very fair state of advancement, with needs for so many minute implements. Unfortunately, the association is far from assured. As however, Mr. Keane† has adduced Noëtling's discovery, among others, as strong evidence of pliocene man, and as the question is of immense importance, I quote in full what the doctor himself has to say on the point: "While stooping to pick up the fine molar which is figured in the accompanying plate, my attention was drawn to some curiously shaped flints partly embedded in the ferruginous conglomerate. Next to the molar just mentioned, I found the fine specimen, Fig. 2; and on looking further about I found about a dozen

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* Rec. G. S., XXVII, p. 101.

† Ethnology, Preface, p. x.

or so of other flints some of which are figured on the same plate. .....Having now described the geological position of the strata in which the flints were found, there still remains the question to be discussed whether they were really found in situ or not. To this I can only answer that to the best of my knowledge they were really found in situ, and that I most probably would not have discovered them if I had not stooped down to pick up the molar of Hippotherium antelopinum, Fig. 6. The exact spot where the flints were found is marked on my geological map of the Yenangyoung oil-field with No. 49, and is situated on the steep eastern slope of a ravine, high above its bottom, but below the edge in such a position that it is inconceivable how the flints should have been brought there by any foreign agency. There is no room for any dwelling place in this narrow gorge, nor was there ever any; and it is further impossible from the way in which the flints were found that they could have been brought to that place by a flood. If I weigh all the evidence, quite apart from the fact that I actually dug them out of the bed, it is my strong belief that they were in situ when found." It is to be inferred from this account that the flints were all visible on the surface, and as the largest is under two inches in length and the majority are much smaller, their being partly embedded implies no penetration of the stratum inconsistent with the effect of water on surface objects. It does not appear that the doctor after this discovery either dug into any depth of the ferruginous stratum, or examined the neighbourhood of the ravine, for other flints; though a discovery well within the stratum would have settled his doubts one way, while failing this, a discovery of the same kind of flints on the surface of higher ground would have settled it another way. The only question as the matter stands is whether it was really impossible for these flints to have been washed down the side of the ravine by rain-water and arrested in their course to the bottom by the ferruginous

gravel. With vertical strata this would, of course, be impossible; but it appears that whatever the steepness of the ravine it was not too steep to be walked over, and to retain on its surface molar teeth much larger than the flints themselves. It appears to me, therefore, that the evidence does not prove decisively that the flints did not reach their position by accident, and that a theory of pliocene man cannot safely be founded on this discovery until other implements are found in such positions as to make it certain that they were embedded in the stratum at the time it was being formed. It may be added that chipped flints of pliocene age, that is, two or three million years old, could hardly fail to show signs of their antiquity in discoloured faces and corroded edges. Dr. Noëtling says nothing about this; but his figures show clean faces and sharp edges.

CHAPTER IV.

THE KARNUL CAVES.

Billa Surgam and Yerra Zari.

THE Karnul * district has yielded the only good example of a cave deposit in India, in contrast with the abundant evidence regarding early man yielded by caves in Europe. The reason of the contrast is perhaps not the want of caves in India, but of people to explore them. But for the intervention of Professor Huxley, the Karnul caves would probably have remained without proper investigation till this day. These caves are situated in the Yerrakonda hills, near Billa Surgam, about 35 miles south of the Tungabhadra, in a region of Cuddapah formation. They were discovered and partly explored by Captain Newbold in 1844, and then forgotten till 1888, when they were revisited by Mr. Foote under the orders of the late Sir M. E. Grant Duff, then Governor of Madras, at the suggestion of Huxley, and were explored by him and his son, Lieutenant Foote. The caves, three in number, known as the Cathedral, Charnel House and Purgatory caves, are formed in the usual way by erosion of limestone rock by water entering through holes in the surface or at the back. They extend some hundreds of feet into the hill, ending in narrow passages through which the water must have entered, and have the appearance of considerable antiquity, being above the present drainage levels and full of stalagmite in enormous masses.

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* Rec. G. S., Vols. XVII., XVIII.

The upper surface of the internal deposits consisted of about 3 feet of the dung of birds and bats mixed with broken pottery, charcoal and other signs of comparatively modern habitation. Below this in the northern or Charnel House cave was a rubble bed with fallen blocks of limestone, some 3 feet thick, succeeded by red clay 4 feet thick, under which was another rubble bed of over 2 feet. Below this, red cave earth, becoming sandy or marly towards the bottom, was excavated to a depth of nearly 18 feet without reaching the bed-rock. The top rubble yielded bones of antelope and monkey, and the red earth immediately below charcoal and red glazed pottery of antique pattern. On the surface of this clay a much splintered human skeleton was found. The cave-earth next below the second layer of rubble yielded only bones of rats, bats and lizards, but a sandy layer below, and about 16 feet from the surface, contained a well-made bone gouge and two pieces of stag-horn cut by a sharp implement, together with charcoal. The same layer yielded bones of an extinct civet, Viverra karnuliensis, besides those of living species of antelope and deer, and the same animals with monkeys and a snake were found in lower marl. Bones of rhinoceros, horse, crocodile and bison were also found in this cave at unstated depths.

The Purgatory cave which was narrow, shallow and long, had a thick stalagmite edging succeeded by a breccia of red clay, stalagmite and fallen limestone to the bottom of the cave at 31 feet. In the breccia were found bones of large and small species of Felis. Two rude earthenware bowls were found 11 feet below the surface in this cave; but their relations to the stalagmite and the breccia are not stated so as to make it clear whether their age must necessarily be great. This cave was only excavated for a short distance from its mouth.

The Cathedral cave contained masses of stalagmite at the sides, and the relics of a floor in the shape of irregular

blocks 4 or 5 feet thick under 6 feet of superficial bats' dung and grey sand. Under this floor were 18 feet of red cave-earth and 15 feet of black and grey marls. A large number of bones of living and extinct species, which will be again referred to below, were found at various depths below the stalagmite, but mostly in stiff red clay 12 feet down. Molars of rhinoceros were found in the dark marl below this, and birds in black marl 8 feet lower; beyond this the beds became sterile.

Human bones were not found here, but evidence of man's existence abounded in the shape of some 1,700 cut bones, of which 200 were implements representing, according to Mr. Foote, awls, arrow-heads unbarbed or with one barb, spear-heads, daggers, knives, scrapers, chisels, gouges, wedges, axe-heads and sockets. The dagger is described as having the blade fabricated from the united fibula and tibia of some ruminant, with the calcaneum as the handle. The harpoons or arrow-heads are said to have been somewhat wavy as if anticipating the Malay kriss. A perforated stone or bone bead was also found in an upper layer of the cave-earth. No account is given of the precise horizons of these implements and of the animals with which they were associated, and it is not clear if we are to understand that they were found at all depths of the red clay. No stone implements were found in any cave, except a minute triangular bit of quartz. In the Chapter House, a small cave opening on the Cathedral, a human molar was found under 4 feet of red clay which was overlaid by 1½ feet of black gravel. There was apparently no stalagmite in this cave; but the red loam may correspond to that below the stalagmite of the main one.

Another cave at Yerra Zari in the vicinity yielded glazed black pottery of antique pattern at 2½ feet below a surface of black soil, and coarse pottery and fireplaces with charcoal at a depth of 12 feet. At another place in the cave red pottery was found in brown cave-earth at a depth of 13 feet with

bones of undeterminable animals. There are many other caves in the neighbourhood which were not examined.

The bones of the Billa Surgam caves, (other than the implements) some 3,000 in number, were examined by Mr. Lydekker,* palæontologist to the department, who found that besides existing species of mammalia, they comprise five extinct species: Mamely Sus karnuliensis, a pig; Viverra karnuliensis, a civet cat allied to a Siwalik species; Rhinoceros karnuliensis, resembling R. etruscus of the pleistocene of Europe; and a bear apparently identical with Ursus nomadicus of the Nerbudda gravels. There were also a Cynocephalus, Manis, Hyæna and Equus now only found in Africa. The fauna of the caves has thus an archaic appearance, and is considered by Lydekker to be late pleistocene. The same geological term is applied by some authorities to the several strata (probably themselves somewhat widely separated in time), with which the ancient stone implements of the Nerbudda, of the interior of the peninsula and of the east coast are associated, and when we find it again applied to the strata in which these bone weapons are embedded, we perceive how little the wide categories of the geologists, founded on a slow succession of sediments or animals, are adapted to give us suitable horizons for the progress of man. For if it be geologically correct to include the fauna of the Nerbudda gravels under the same classification with that of the Karnul caves, it is anthropologically inadmissible to give the same horizon to the stone-chippers of the former and the bone-workers of the latter. The interval of time between the Bhutra stone and the Billa Surgam arrows and dagger, although it may have made no difference to the pleistocene rhinoceroses and bears, was obviously long enough to make a vast difference in the progress of mankind, and the fact that the beginning and the end of it are both included geologically in the late pleistocene

* Rec. G. S., Vol. XIX.

must not be allowed to obscure our perception of its length. The geologists will not stint us in years.

These remarks are made on the assumption that the bone implements were actually in association with the extinct animals, though except in the case of the civet, this is not made prefectly clear in the accounts accessible to me.* The bones were, indeed, supposed to bear marks of cutting, and this, if established, would settle the point; but Lydekker thought that those he saw had been gnawed by porcupines. However, there is no improbability in the bone-workers having been contemporary with the animals, for several extinct species, including the mammoth and the cave bear, survived in Europe to a time when art was even more advanced than it was with these Karnul men. The manufacturers of the red pottery found in the caves must, however, belong to a much later period; for this pottery can only be associated with an advanced stage of the neolithic age.

* I attempted to trace the further history of these implements by writing to Mr. Foote, and inquiring at the British Museum, but without success. It would seem that they were sent to a European scientist for examination, and with that all allusion to them in the records of the Survey Department ceases. This is the more disappointing in that they are unique of their kind in India.

CHAPTER V.

THE SURFACE PERIOD.

Discussion of term—Central Provinces, Central India, Bundelkhand, Behar, Chhota Nagpur.

To Evans, who is still, old as his book is, the leading authority on stone implements, the terms neolithic and surface period were synonymous,* and if this could be accepted as satisfactory, there would be no room for this chapter in a work professing only to deal with palæoliths. But there are two strong objections to the identification of the two terms. The first is that at least three-fourths of the undoubted palæoliths hitherto found in India have come to the surface—and others are daily coming to it—by the gradual washing away of the deposits in which they were originally entombed, and the second is that a large number of the most recent neoliths—those associated with glazed pottery and the beginning of the iron age—have been found below the surface. Everything depends on the circumstances of the case. If the stone when last dropped lay in a position particularly exposed to silting by a river or by rain-wash, it might in a few thousand years be covered by 20 feet of alluvium like certain neolithic flakes found by Mr. Carlleyle† of the Archæological Department near Ghazipur; while on the other hand if it lay in a position sheltered from any such influences and from the growth of vegetation, like a chipped stone found by Mr. Foote on a ledge of rock in Bellary,‡ it might remain exposed for

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* Ancient Stone Implements, 1872, p. 12.

† Rep. Archæo. Surv., Vol. XXII, pp. 77-80.

‡ Mem. G. S., Vol. XXV.

a hundred thousand years. Even, therefore, if the term surface period be restricted, as it ought, so as to apply only to stones which there is no reason to suppose have been weathered out of older formations, it would still be objectionable as an equivalent of neolithic, because it would certainly include implements of very different ages, and might possibly slur over an important break of historical continuity. It is, therefore, advisable to keep the term neolithic only for polished or ground objects, and for the flakes which can be associated with them by being found either with them or with pottery or in late interments, and to prejudge nothing about others that are found without such association. It will be seen presently that I propose the term mesolithic for those lighter chipped implements which became prevalent in the interval between the heavy implements of the earliest age and the ground tools of the latest, and I now proceed to enumerate the places where surface implements that may or may not belong to this stage have been found.

I have already mentioned some, which ought perhaps to have been reserved for this chapter, as having been discovered in Sind, Madura and Burma, but the special home of the surface flakes is the region between the Godavari and the Jamna, including the Central Provinces, Central India, Bundelkhand, Behar and Chhota Nagpur. The flakes are said to be scattered in thousands over these regions, usually on the surface, but sometimes under a few inches of soil. In the Central Provinces and Central India where the surface rock is ordinarily trap, the flakes are usually of agate, jasper or chalcedony, formations in which the trap abounds: elsewhere they are most commonly of chert. Large collections have been made by Mr. Blanford* between Rajamundry and Nagpur, by Colonel Oakes,† Major Abbott† and Lieutenant

* Proc. A. S. B., 1867.

† Museum register.

Swiney* in the Jabalpur district, by Mr. Rivett Carnac † in Central India, and by Mr. Cockburn ‡ and other observers in the other localities. In the Central Provinces the objects were usually found, not in connexion with the recent alluvium, but on older rising ground where agates could be obtained: and Mr. Blanford thinks they were made in these places for the benefit of purchasers from elsewhere. The objects are cores and flakes. The former which are merely the matrix from which flakes have been struck, are divided by Blanford into conical and prismatic, but as both kinds of core appear to be found together, the distinction has probably no value as a test of age or race. The flakes, besides those that are obviously mere waste chips resembling chips from the existing shops of agate workers in Cambay§ with which I have compared them, are variously described by their finders as arrow-heads, knives or scrapers, but none of the supposed arrow-heads are ever barbed. The edges are not ground or polished. It is certain that unground flakes were manufactured in the latest neolithic age, for they are constantly found with fine glazed pottery, but on the other hand it appears from a thousand examples in Europe, that small flakes were also manufactured in mesolithic if not palæolithic times. Mr. Blanford thought that the Jabalpur flakes ranged in shape from the Dordogne—meaning no doubt the Solutrian and Madelaine—to the shell mound and barrow periods of Europe,‖ a wide stretch of time ranging from Boyd Dawkins' cave men to nearly the historic era. The collection in the Museum, so far as it goes, bears out this view,¶ but the subject will be touched on again in a subsequent chapter.

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* Proc. A. S. B., 1865.

† Ditto, 1866.

‡ Jour. A. S. B., 1879, p. 136.

§ For which I am indebted to Mr. Hatch, the Political Agent, and to the Diwan.

‖ Proc. A. S. B., 1866.

¶ Ancient Stone Implements, 1872, p. 12.

CHAPTER VI.

ANTIQUITY OF THE STRATA IN WHICH PALÆOLITHIC IMPLEMENTS HAVE BEEN FOUND, OR WITH WHICH THEY ARE ASSOCIATED.

I HAVE already intimated that Indian geologists attribute all the formations in which palæoliths have been found to the latter part of the pleistocene age, but this phrase covers a very long period, and I am not aware of any authoritative calculation of its length or of the time which is to be reckoned from its close to our own day. I shall, therefore, attempt by examination and interpretation of the geological features to make some such calculations, however rough, myself. Geologists are averse to define their periods in years, but anthropologists, dealing with the history of man, cannot be satisfied with vague and indefinite categories primarily invented for the classification of mollusks, and if the geologists will not give us the more definite calculations we require, we must attempt them ourselves.

When Mr. Foote's theory of the formation of the coast laterite of Madras under the sea became known to Evans, that eminent authority who was accustomed to discoveries of archaic implements only in fluviatile formations in England, naturally demurred to it, and suggested as an alternative that the laterite beds might have "originally covered one of the slopes of a valley connected with a large river, the other slope of which has now disappeared in consequence of the encroachment of the sea." This theory involves the unexampled hypothesis of a river running parallel with the sea and close to it for over six hundred miles, without sign of source or mouth, but Evans probably thought the laterite was confined

to the small area near Madras in which the first implements had been found. Subsequently, Messrs. Medlicott and King, as quoted in Chapter II, expressed views in favour of a fresh water origin for the laterite without bringing in a river, but left a great deal unexplained. There are, for instance, the high-level shingles which prompted Mr. Foote's theory, and there is the landward scarp of the Cuddalores which is often mentioned but never discussed. I now offer my own contribution.

The Cuddalore range was probably formed under the sea in late pliocene times, and its upheaval may be supposed to have begun either during the close of that period, or at the beginning of the Quaternary age. It has been seen that in some places the height of these strata above sea-level still reaches 250 feet, but it has also to be remembered that the coast-line below the recent alluvium is built up of clays denuded from them, and these clays were thoroughly sounded by artesian borings, as at Pondicherry, have been found to go down to a depth of 550 feet. It may, therefore, be concluded that the Cuddalore range in Quaternary times formed a continuous barrier some 500 or 600 feet high along the entire length of the eastern coast. Practically the whole drainage of the Peninsula from the Western Ghats has to find its outlet on this coast, and if the Cuddalores were upheaved so quickly that the rivers of the time (which followed no doubt essentially the same courses as the present ones) could not cut through them *pari passu* with the elevation, it follows that the latter must have been more or less dammed at their mouths, and thus subjected to great floods in every part of their courses. The geological evidence points to such a state of things having actually occurred. The surviving relics of the Cuddalores with their scarp towards the land and their gentle slope towards the sea, proclaim that the range was once a barrier to water on the land side, which scoured and overflowed it, scraping off the upper strata

and depositing them on the rocky shore below. The abundance of clays with vegetable remains in these deposits shows that they were laid by fresh water coming from a well-wooded land. Then on the gneissic uplands immediately behind the Cuddalores, we find enormous beds of shingle and the remains of gravels such as would have been formed by raging waters swirling backward from the barrier against the hills in the rear. Finally, a tale of wide-spreading inundations is told by the accumulation of shingle, gravel and lateritic terraces which have already been described as marking the country in the neighbourhood of the great rivers for hundreds of miles up their courses. The spectacle of the Godavari spouting over a lofty ridge in its valley, which was marked with awe by the natives in the early part of the last century (as related by Mr. Foote) was one of a kind which must have been common to the eyes of pleistocene man. This period of great floods, and of the gravels and shingles created by them, must naturally have had its end when the Cuddalores had been both cut down and cut through, so that the rivers could pursue their courses without serious obstruction to the sea; and therefore the laterite "skin," as it is often called, which overlies the remnants of the range, belongs to the final stage of the period. It is not to be supposed that the prevalence of laterite at this last stage marks the introduction of a new element: the occasional presence of laterite in the Cuddalores themselves and the constant occurrence of ferruginous matter at all depths in the coast beds shows that laterite was being brought down by the rivers from the earliest periods, and this was in fact inevitable, seeing that it was forming sub-aerially on the trap and gneiss from mesozoic times. Some sort of laterite skin would no doubt have been visible at any stage at which the denudation of the Cuddalores might have stopped, and its comparative thickness in the last period may be attributed to the fact that it was laid by water which had become gentle and intermittent, enabling the iron oxides to consolidate the

gravels and form almost indestructible conglomerates. On the theory which I propound the high-level shingles and gravels in the country behind the Cuddalores must generally be older than the laterite overlying the latter, since the high floods of the interior implied a high barrier. The gravels thus represent an earlier pleistocene, while the coast laterite belongs to the close of the period and as it were seals it up.

The recent period which followed has seen the creation of all the beds of fine regularly laminated alluvium, often of great thickness, which now border the rivers along their courses, and of the great deltas of the Godavari, Kistna and Cauvery comprising many thousand square miles, with the deposits of the smaller rivers forming a belt 8 or 10 miles wide in the intermediate stretches of the coast. The geological records deal very cursorily with this alluvium and thicknesses are rarely recorded, but it appears that the up-country alluvium of the Wardha and Godavari is sometimes 70 feet thick, and as some of the small rivers are said to have formed deltas 15 feet thick, it may be assumed that the deltas of the larger ones are very thick. It also appears that most of the rivers if not all have long changed from depositing to eroding forces, and are cutting through their deposits. We are thus able to arrive at some estimate, however imperfect, of the length of the recent period. According to calculations of Mellard Reade which are accepted by geologists of authority,* a large river will on the average deposit one foot of sediment over an area equal to that of its own drainage in 4,500 years. The area above the sea over which the Godavari deposits its alluvium is probably much less than its drainage area, and the region above the gorge must certainly receive a much larger share of the sediment than it would be entitled to on an equal distribution ; but supposing that the valley receives four times its share, a period of about 80,000 years would be

* Geikie, Text-book of Geol., p. 590.

required to raise the alluvium to the recorded height of 70 feet and allow for something more removed by sub-aerial denudation. The river, however, even with its floods of 40—60 feet, could not have laid this height of alluvium from its present level, and we must allow for its having since cut down the old bed by at least 20 feet. As erosion even in a river bed is ordinarily a very slow process, it is probable that we must allow at least 100,000 years for the two processes combined. This is little enough, probably too little, for the recent period, considering that within its limits a line of sandstones has been formed from India to Ceylon in a position which seems to indicate that Palk's Bay must have been largely dry land, since washed away like the old deltas of the Penner, Swarnamukhi and Palar rivers according to Dr. King.*

As regards the length of the preceding pleistocene period we have the fact that the Cuddalores have in places been denuded and their deposits laid at their feet to a depth of 550 feet, which by the canon adopted, might imply a space of 2½ million years. The canon, however, has been founded on the average operations of modern rivers, and may not be safe for the floods of the pleistocene, which were perhaps quicker in their action. We may therefore look to another quarter for confirmation or check. According to the Manual of Indian Geology† the gravels of the Nerbudda have in places a thickness of about 500 feet, of which 400 feet are below the present bed and the rest above it. This means that since the Nerbudda became a depositing force, it has filled up its rock basin, which is of unequal depths, to a thickness which must originally have been far more than 500 feet (for sub-aerial denudation has been at work ever since to reduce the top strata), and then when it changed from a

* Mem. Geol. Surv., Vol. XVI.

† Ed. of 1893, page 397.

depositing to an eroding agent (probably owing to an elevation of its bed), it cut down again through 100 feet of this. If, following Medlicott,* we cancel the erosion against the recent period, we have the deposit of the gravel, which is all classed as pleistocene, to give the minimum measure of that period. By the canon it might have taken 2¼ million years to form the thickness of 500 feet if the basin of the river intercepted only its proper proportion of the silt, or something less in proportion as the basin absorbed more than its share. Perhaps no very heavy deduction is to be made on this account, for in the first place, the drainage area of the Nerbudda, unlike that of the Godavari, is not extremely disproportionate to its area of deposit above the sea, and secondly, the calculation of time has taken no account of the thickness which has been lost by pluvial denudation. The indications, therefore, from both the Cuddalores and the Nerbudda are that something not far short of two million years is required as the length of the pleistocene period. However, to make full allowance for more energetic deposit when India was a wetter place than it is now owing to the glaciers of the Himalayas and their influence on the climate we may reduce the estimate to 1½ million years.

Given this as the length of the whole pleistocene, there is no difficulty in calculating the length of that part which concerns man in India, and which the geologists style the late pleistocene. This period begins with the fossils visible at the base of the 100 feet of cliff which stand above the present bed of the river, and the length of the epoch will therefore be one-fifth of the whole, or 300,000 years. Adding to this the length of the recent period (which I have almost certainly under-estimated), we get a minimum age of 400,000 years from the present time as that of the Bhutra palæolith. The ages of the other stones of true palæolithic type may be

* Rec. G. S., Vol. VI, p. 53.

taken to lie between this date and the beginning of the recent period.

It is impossible not to pay a tribute to the sagacity of Medlicott when in 1873, though he knew nothing of the real depth of the Nerbudda gravels, he insisted, against high palæontological opinion, that there must have been a great break between the pliocene Siwaliks and the bottom of the Nerbudda cliffs. We see now how long the break was. The strata which bridge it, could they be got at, would doubtless be found to contain animal forms intermediate between those of the Siwaliks and those which lay about the Bhutra stone in the Nerbudda cliff; and it is of course possible that the handiwork of man might also be found among them. But so far as the evidence at present goes, there is nothing to carry the age of the palæolithic stone chippers of India beyond the last phase of the pleistocene epoch.

In Europe the first stage of the pleistocene is regarded as coincident with the first and severest glacial epoch. No stones are attributed with certainty to this age. The mid-pleistocene was interglacial, and a few stones are assigned to it. But the majority are assigned to a later period, when the second ice-sheet had come and was going away again. I am not aware of any accepted estimate of the duration of these various phases of the glacial epoch; but it will be clear that on my calculation of the Indian dates, the stones of both continents have much the same horizon; though the earliest Indian stones hitherto discovered do not appear to be so old as the earliest of Europe.

CHAPTER VII.

DESCRIPTION AND CLASSIFICATION OF THE STONES.

AS a preface to the examination and classification of the Indian palæoliths it is desirable to refer to the classification of the corresponding stones in England and France generally accepted on the authority of Boyd Dawkins, Evans and Mortillet. Four principal periods are recognised. The first is that of the river drifts or high-level gravels (in France St. Acheul gravels), in which the implements are large flints or quartzites, sometimes 8 or 9 inches long, chipped mainly into discoid ovals sharpened all round, or pointed ovals sharpened at the point, or oval scrapers with one side sharpened. Small flakes whether pointed as borers or sharpened as knives are rare in this period, and bone implements are unknown. The next three periods are all founded on deposits in caves, and are termed the Moustier, Solutrian and Madelaine types; the first corresponding to Dawkins's cave-men of the strata below the stalagmite, and the two last being an amplification of his cave-men of the strata above the stalagmite, in the Cresswell and Kent's Hole caves.*

The traces of the cave-men of the Moustier type were found in old cave-earth, associated with the bones of the sabre-toothed tiger, the hippopotamus, cave-bear, mammoth, straight-tusked elephant and other animals little if at all later in type than those of the river drifts. The implements of this period are usually of river drift shapes and sometimes of river drift size and rudeness; but they are more often of smaller size and better chipping, and flakes of various shapes are common. Bone implements are very rare. The traces

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* *Early Man*, pp. 178, 194.

of the other two classes are found in the upper strata of the caves, usually above the stalagmite when it is present. The heavy implements of the older types have now disappeared, and in the Solutrian period are succeeded by highly finished articles of flint (often imported from a distance), apparently intended as spear-heads, borers, knives and the like, the spear-heads of France being beautifully leaf-shaped. Implements of bone or horn are tolerably common, and engravings of animals begin to appear. In the Madelaine period well made flakes of various shapes, including saws, continue to appear; but bone and horn have superseded stone for the heads of some weapons, and the delicate flint spear-heads of Solutre no longer appear. Besides spear-heads, elaborately barbed harpoons, awls and needles of bone are found, and engravings of high excellence are executed on the same material.

It seems clear that the cave people of the Moustier age are nothing but the river drift men in a somewhat higher stage of development; whereas when we pass the interval represented by the deposits of stalagmite, evidently of some duration, though the fauna is still of late pleistocene type, we come upon a new age and doubtless a new race, which had learned to attach stone to wood, and had thus passed from the manufacture of implements to that of weapons. On the other hand, there seems no break between the Solutrian and Madelaine periods, but probably there was a break between these and the final stone period of ground and polished tools. It will accordingly be convenient to modify the old nomenclature by restricting the term palæolith to the river drift and lower cave types, calling the Solutrian and Madelaine mesolithic, and leaving neolithic as at present to cover the recent age when ground tools were introduced, though not to the exclusion of chipped flakes.

The Billa Surgam caves prove that in India also there was a cave period associated with a copious manufacture of

bone implements and it would seem that we must correlate this with some stage of the cave period of Europe. Beyond this general supposition it is impossible to go at present, for want of an authoritative comparison of the Indian implements with those of France, and for want of any stones, except the triangular chip of quartz, which can be associated with them. If this supposition be correct, the bone implements and weapons of the Karnul caves may have been as much later than the oldest quartzites as those of the upper breccia of the Cresswell caves were later than the flints of the English river drift. But no examples of the delicate spear and arrow heads of stone which accompany the bone implements of France have yet been discovered in India, so that we are not in a position to say whether the men who introduced this fashion in Europe ever showed their faces in this country. It will be seen presently that there are clear signs of an intermediate period in India: that is, a period in which the implements were not of precisely palæolithic or neolithic shapes; but whether this was due to a gradual evolution or to the influence of a new race must remain uncertain till the exploration of fresh caves supplies us with evidence on the point.

To anyone looking at a collection of palæoliths for the first time it would seem that the stones were of all shapes and sizes, but mostly large and clumsy. The sizes, however, in fact, vary from 10 inches in length to 1½ (apart from flint flakes), and the shapes may be roughly reduced to four standard types: the pointed oval (Figs. 1, 2), the discoid oval (Fig. 3), the scraper (Fig. 4) and the oblong chopper (Fig. 5). The first three of these are common to India, Africa and Europe; the chopper is peculiar to India and Africa, except for one Spanish example. But the absence of flint from the greater part of India, and especially the peninsula, placed palæolithic man in this country at a great disadvantage compared with his fellows in Europe. In the manipulation of quartzite, granular quartzose, limestone, sandstone and trap it was

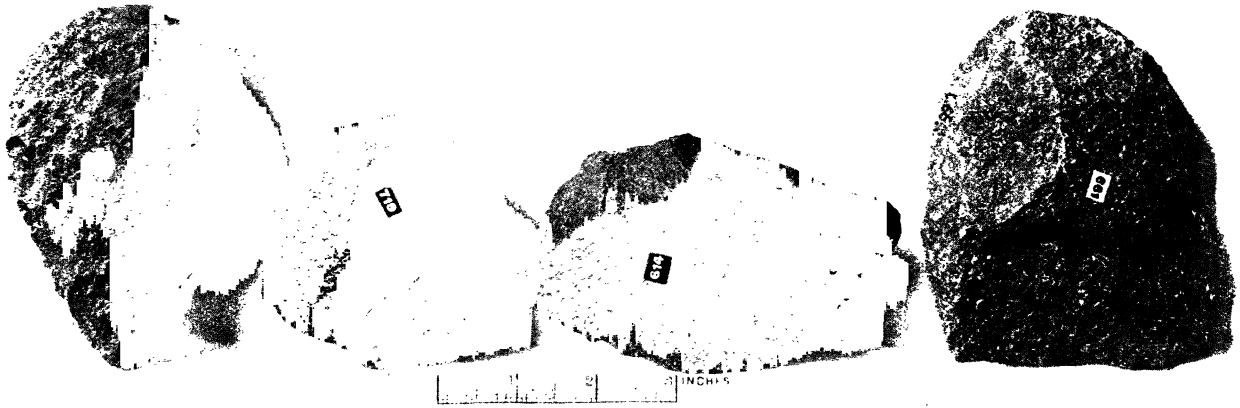
FIG. 1.

not easy to secure a very close approximation to the particular type which he may have had in his mind; and therefore while the above categories represent types that were aimed at, the variations from them are somewhat more numerous than those which are illustrated by the books on English stones. Most of the variety both in shape and size is thus, I believe, due merely to the material; but on the other hand, progress in time seems to have been accompanied by a diminution in the size of implements, and, as already intimated, there are variations of shape both in small and large stones which appear to be new developments rather than accidents. These will be dealt with as they come up for notice in the more detailed description to which I proceed.

Pointed Ovals.—The characteristic of this class is that one end of the implement is more pointed than the other, and the pointed seems to have been the "business end," as contrasted with neolithic celts in which the pointed end is always intended for hafting, and the broad end for cutting. Among the pointed ovals may be distinguished those with a blunt butt like Fig. 1, a Madras stone, and those which have been chipped all round to something like a cutting edge (Fig. 2, from Bhutra on the Nerbudda). But there is no hard and fast line. The blunt butts are not by any means always untrimmed and smooth like Fig. 1, nor are the points always so sharp: on the contrary, there is a complete gradation between the types of the two figures. And the stones again of the Bhutra type show every gradation towards roundness until the semblance of a point disappears and we find ourselves among the discoids (Fig. 3). But with both kinds there is also a variation in the opposite direction towards narrowness, until ovality altogether disappears as in Fig. 7. This example is blunt at both ends, and was possibly a new type of scraper developed at a late date, though it comes from Atrampakam with Mr. Foote's Madras collection; but there are many examples of narrow implements with one or both ends chipped

sharp such as No. 720 of the Museum catalogue (Mr. Foote's first palæolith) and No. 721 from the Madras collection, and others chiefly of trap, from Bundelkhand, Damoh and Marpha. I regard this approximation to a knife shape as something more than accidental, and would class all stones of this shape as mesolithic, and giving an approach to the somewhat similar shapes from the French caves. I believe, though there is a want of precise information on the subject, that they were all found on or near the surface. Another not common variation which gives the stone something like the shape of a boy's kite is probably due merely to accidents in chipping.

There is yet another shape which I must introduce here for want of a better place, though it is most distinctly not a pointed oval. These are certain implements in which the narrower end of the stone has been truncated, while the broader end is chipped to an edge. A conspicuous example is a quartzite 6½ inches long from Palundra in the Nizam's Dominions, in which the truncated end is only 1½ inches wide, while the cutting end is over 3 (No. 14 of the catalogue). In a quartzite from Roodrar the truncated end is 2¼ inches, the cutting end 3¼. These truncations are not accidental, but apparently as old as the stones. It is of course impossible to say that these are cases of ovals of the type of which Figs. 1 and 2 are examples, for here the end which would have lent itself to pointing has been deliberately struck off and the broad end prepared for use. Nevertheless there is every gradation between the two styles. Thus there are quartzites from Bennihalla (No. 277) and Edlabad (No. 42) in which the truncated and sharpened ends have the same breadth or nearly so, and others from Sattavedu in Madras, Chanda and other places showing every degree of diminution in the breadth of the sharp end and increase in that of the truncated end till at last we get back to the true pointed oval with truncated base as illustrated by Fig. 415 of Evans's Ancient stone implements. But the Palundra and Roodrar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INCHES

types are repeated in a small Atrampakam quartzite (No. 515) and flourish among the trap stones of Marpha, some of which look almost as if they had been ground a little. I think, we have here a distinct development of a new style for scraping hides, which survived to neolithic times.

Discoid Stones.—Fig. 3 from Madras gives the standard type of the disks, which is a rude circle chipped from a central point, leaving a ridge, while the other side, as indeed with most of the ovals, is flat. I have already observed that the pointed ovals pass into this shape by insensible gradations, and stones which approach the circle as nearly as my illustration are in fact rare. In size the disks, or discoid ovals, vary from 6 inches to 1½ in greatest diameter. I have only to add that the ridge is nowise peculiar to this class; for although Figs. 1 and 2 do not happen to show any such ridge, it is nevertheless more common than not in implements of their classes. It probably had its use in the disks, for gripping, and in the others it may have been left because of the danger of breaking the stone across in trying to plane it off. The added weight also may possibly have been desired in the pointed ovals that have it, if they were used for other purposes than those which have no ridge.

Scrapers.—Fig. 4 from Atrampakam is a handsome example of this class, which is distinguished by a smooth surface at the top, and at one side for the fingers, with an edge chipped sharp at the bottom. This type of stone presents fewer variations than any other, and there is no doubt of its purpose. In neolithic times it seems to have been replaced by the truncated oval shape described above, but the two shapes were contemporary both among the quartzites of Madras (Museum No. 515 of Atrampakam being a truncated oval) and among the trap mesoliths of Marpha, where Nos. 2063 and 1954 of the Museum represent them both.

Choppers.—Fig. 5 illustrating this type is also from Atrampakam, which, as will be seen below, offers several

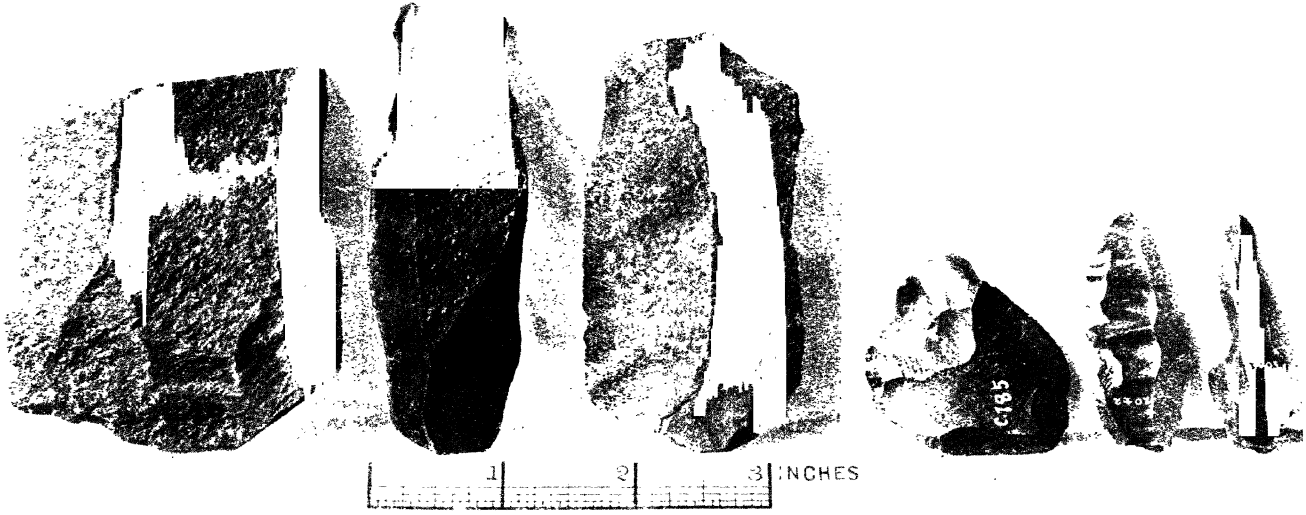
ohter specimens exemplifying the whole range of development which the type underwent. The choppers are always blunt and often smooth at the butt, for use by hand; but they are sometimes chipped at the sides as well as at the edge as if they were used for tearing through hides and flesh after incision, as well as for cutting clubs and big bones. Their edges are generally straight; but are sometimes rounded. The common shape is more elongated than the illustration, and in some examples (*e.g.*, a quartzite from Saugor, No. 91, and another from Atrampakam, No. 764), the butt is broader than the edge. If the chopper could be taken as among the very earliest implements fashioned by man (but the evidence is against this), this latter type might have been the parent of the sharp pointed stones illustrated by Fig. 1, when man realised that he had use for a point as well as an edge. However this may be, there seems no doubt that the chopper took another line of development which ultimately resulted in the neolithic celt, though two things could hardly be more dissimilar than Fig. 5 and such a celt. Every step of the road is, however, marked out by examples in the Museum. A quartzite chopper from the Kistna district (No. 196), and one of sandstone from Jalihal (No. 543) both show a shape in which the butt is narrower than the edge, and this is carried further in a Saugor sandstone (No. 96). Next, in a Nellore quartzite (No. 522), the butt is so much narrower than the edge as to approach towards a point, and in a splendid Bennihalli quartzite (No. 262) the butt is a point pure and simple, though perfectly blunt, and the stone rays out to a great curved edge, 4½ inches across at its broadest. A small Bellary stone, 3 inches long (No. 336), is nothing but a rude chipped celt with convex edge, and finally we return to Atrampakam to find in No. 525 a little triangle with clean apex and clean straight edge which would be called neolithic without question if it were not a chipped quartzite. In the absence of precise information by the discoverers as to the positions in which

these several stones were found, it is impossible to say whether the triangular shape is as old as the oblong, or younger, as is more probable ; but it is suggestive that we find the parents of the neolithic celt in the material and the locality of stones some of which are undoubtedly very ancient. As already observed, the oblong chopper is practically unknown in Europe and it does not appear that there are examples of triangular chipped choppers either. If this type is in fact not represented in Europe, the question arises whether the neolithic celt did not have its birth in India by direct and unbroken descent from palæolithic times. The question is outside my present theme, but some further remarks on it will be found in the next chapter.

From what I have already said above it will be clear that I do not regard all the stones coming from the peninsula as of equally ancient date. I have intimated that I believe the long narrow knife or scraper shapes of Chingleput, the truncated oval scrapers of Palundra, Roodrar, Bennihalli, Edlabad, Sattavedu, Chanda and Atrampakam, and the pointed-butt choppers of Nellore, Bennihalli, Bellary and Atrampakam to represent later developments than the other palæoliths, and to be connecting links with the corresponding implements of neolithic times, from which indeed some of them appear not very distant. In doing this, I have been obliged to follow the method of inferring the age of a stone from its shape, instead of from its position in strata ; but this is unavoidable where most of the stones are found on the surface with nothing to show, or at any rate nothing which the discoverers tell us to show, whether they have weathered out of gravels 100 feet thick or 10 feet thick or nothing at all. Such absence of information may often be inevitable, for if thick gravels have been wholly denuded away, a stone which was once at the bottom of them may come to lie alongside of a stone which was dropped a hundred thousand years later and has never been covered at all ; but

it is to be supposed that there would often be some sort of indication of age, and whenever there is, it might be wished that collectors would record it as minutely as possible.

That there was a mixture of early and late periods in the peninsula seems certain from such stones as are illustrated by Figs. 6 from Palundra in the Nizam's Dominions and 7 from Madras, which, though quartzite, betray shapes and a clear smooth cutting to which there is no parallel in the known palæolithic implements of either India or the English river drift, while they resemble the style of some of the cave implements of France, and the surface flint figured as No. 8. When we cross the Nerbudda into North India, except for the implements of Vindhyan sandstone found in the vicinity of the river, and doubtless weathered out of the pleistocene gravels, the Rajputana quartzites and perhaps a few others to be mentioned presently, we appear to have distinctly reached a later age than that of the oldest Madras stones. The trap implements of Marpha and other places in Bundelkhand are undoubtedly very rude in style and shew some old shapes ; but the rudeness is probably due largely to the material, and to set against the old shapes there are truncated scraper shapes, such as Nos. 1954 and 1949 of the Museum, long narrow shapes such as 1982, and almost neolithic celt shapes, though chipped and rude, such as Nos. 136, 137, 155 and 1966. The trap stones of older shapes bear some resemblance in bad chipping to certain sandstones of the Andaman Islands collected by Dr. Stoliczka, which may not be very old and can certainly not date back to any age before navigation of the sea was established. It is unfortunate that the journals of the Archæological department contain no account of the positions in which the Marpha stones were found, and that no one who helped to gather them has written anything about them, to throw light on the question whether they represent a gradual evolution of neolithic from quartzite forms ; and if so, whether the makers were the descendants of the quartzite men



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themselves, driven into a new geological area and to the use of a material they had previously disliked, or a foreign race adopting and changing quartzite forms.

Again flint No. 101 from Central India suggests a transition age; for though a rude oval, it has its broader end sharp and its narrower blunt. Of the stones from Lower Bengal, the Dhenkenal quartzite, No. 53, is a rude and heavy pointed oval, and may be very ancient, while another smaller quartzite oval from Jherriah may be of either age. The Attock limestone (No. 814) and another from Hazara are unground or half ground neolithic celts with convex instead of straight edges. Of the surface agates and jaspers which have been collected, it is said in thousands, the Museum contains only a partial and totally unsorted collection, though cores are numerous enough. Of the implements, No. 1501 from Jabalpur is a badly chipped oval which might, with an inartistic people, belong to any age, and the same may be said of No. 41 from Berar. No. 187 apparently from Jabalpur is a truncated scraper of jasper. No. 185 given as Fig. 9 of my illustration was probably meant rather for slicing bark or other such matter, than as any kind of weapon, and with the two next it is undoubtedly neolithic. These two, the flakes figured as Nos. 10 and 11 are among the most intelligible of the collection, and were either arrow-heads or borers. A flint from Rohri in Sind (No. 856) is apparently a truncated oval or rather oblong scraper, something like Fig. 396 of the cave period in Evans's book, but better cut. From the much superior collection of surface agates of North India which exists in the British Museum it would appear that these implements all belong to the neolithic period, though, a previously remarked by Blanford, those found at Rohri mostly knife and scraper forms, look older than the rest. The Guide to the Stone Age, published by the British Museum, classifies them all under the neolithic age along with the latest type of polished celt, but somewhat discounts its

own authority by including illustrations of the most authentic types of Indian quartzite palæoliths under the same heading. The letter-press, however, corrects this error by the admission that these latter "all find a parallel in the products of the river drift in this country, and may well belong to the corresponding period." This restores all, for the authorities of the British Museum do not, like those of the Museum at Leicester, regard the English river drift implements as neolithic!

CHAPTER VIII.

DISTRIBUTION OF THE STONES AND OF THE MEN WHO USED THEM.

Quartzite, trap and flint periods—uses of the old stones—observations on the later implements.

THE geological map of India shows the Madras Presidency, Orissa and Chhota Nagpur coloured red which denotes gneiss; but varied by a great block of Cuddapah quartzites (with coast offshoots), in the east-central area south of the Kistna, by streaks of this formation along the course of the Godavari and by another great block of the same, with offshoots, around Raipur and Raigarh where the Central Provinces join Chhota Nagpur. The formation is repeated in a narrow band just across the Nerbudda, and fragments of it appear again in Central India and Rajputana; but in these parts the Vindhyan sandstone and trap are the prevailing rocks. All north of the Jamna is recent alluvium. Turning south practically the whole of the Bombay Presidency and half the Central Provinces and Hyderabad are coloured green to represent trap; but the quartzites re-appear as a small block in the Kanarese country, where Bombay and Madras join their frontiers.

The gneiss was evidently disliked for implements, though there is one of this material in the Museum (No. 154), and from the whole of the peninsula south of Madras, wherever the formation is only gneiss, no palæolithic implements appear to have been reported. Should it be the fact that no implements are there, and if the absence of implements necessarily implies the absence of humanity, it will be proof of the limitations of primitive man that he should have been unable to colonise so

extensive and no doubt well wooded a region simply for want of a certain kind of stone. I take it, however, that man was a user of clubs and unchipped stones ages before he thought of chipping, and when there was no suitable stone to chip he doubtless never rose out of, or reverted to, the earlier stage, At any rate, if he did not colonise the gneissic region, he passed through it, for he is found in Tanjore and Madura chipping quartzose and chert from local formations of those materials.

The range of the quartzite implements naturally follows that of the formation ; and thus we find them abundantly on the east coast north of Madras and in a broad belt across the peninsula where the quartzites of Cuddapah and Karnul hold out their hands across a gap in Bellary to the quartzites of Dharwar, and again plentifully up the Godavari. They also exist between Raipur and Raigarh (the examples are in the British Museum), and one example is reported from Orissa.

In Bundelkhand, Central India and Rajputana quartzite implements occur sparingly in proportion to the rocks ; but in the neighbourhood of the Nerbudda the place of this rock was evidently taken with ancient man by the Vindhyan sandstones, of which the Bhutra stone, perhaps the oldest implement discovered in India, is an example. In this region also trap, which covers half the Central Indian Agency, comes into evidence as a material for implements, and, as already stated, agate, chert and various other flints bestrew the surface from the southern border of the Central Provinces to the Jamna and as far west as the Indus.

Quartzite implements re-appear again on the Sabarmati in Guzerat : but between this and Dharwar no implements appear to have been reported from the Bombay Presidency. East of Dharwar limestone appears as a material for implements in a small locality, and in Bellary we come to jaspers.

Since primitive man was so obviously tied down to the material which he happened to find wherever he located himself, no theorising could be idler than that which attributed

a difference of race or age for every variety of stone used; and I do not think that the evidence of the Calcutta and London collections justifies the assumption of more than three periods—the quartzite, trap and agate—and *possibly* three races.

The men of the quartzite and most ancient period appear, as already will have been gathered, to have inhabited the coast from Orissa to South Arcot, and inland as far as Karnul. From Arcot a colony detached itself to Tanjore and Madura where quartzose and Vellam chert supplied suitable materials in place of quartzite, and from Karnul another branch passed across the Tungabhadra, perhaps leaving out Bellary, and colonised the Southern Maratha country. Here they used quartzite or limestone as necessity required. Of the same race, and either contemporary or older, were the men who lived along the Nerbudda and made implements either of quartzite or more commonly of Vindhyan sandstone. As regards the Rajputana stones described as quartzite, they are not as a rule so large as those of the peninsula, and by themselves might not have been sufficient to establish identity between their makers and the rest of the quartzite race. But there are the Sabarmati quartzites, regarding which I have quoted what has been recorded by Mr. Foote in Chapter III, and from the great antiquity indicated by their position they must go back to the earliest period. Now the Sabarmati must have washed those stones down from Rajputana, where it has its rise, for there is no quartzite, I believe, anywhere near Ahmedabad, and therefore the range of the earliest quartzite men is established for Rajputana, whatever the age of the smaller implements from that part may be.

Whether these ancient men either came into or went out of India, and by what gate, cannot be answered from local evidence, because since the days when they were flourishing on the Nerbudda, the rivers of the Himalayas have laid one or

two hundred feet of alluvium over any traces they may have left north of the Jamna. But from the essential identity of so many of the forms of implement in the two places it cannot be doubted that there was a connexion between the quartzite men of India and the river drift men of Europe, and the question arises whether the type was developed in India and passed into Europe or the contrary. On the point of probability, there was little to tempt man to leave India for Europe when a glacial period was in full swing there, while on the other hand, there was every inducement at that period for the European man to come here. Moreover, I have strong doubts whether men in India would ever have succeeded in chipping quartzites so well had they not first learned the art on a more tractable material. In all the implements I have examined in the Museum I do not see any traces of the "prentice hand," in the shape of "eoliths" or stones shewing the first dawning of the idea of chipping. The Bhutra sandstone has been corroded by antiquity and shows a rude surface; but the shape is admirable and proves that chipping was no novelty to the man who made it. Lastly, although the Indian evidence cannot help us regarding man's movement north of the Jamna, it seems to indicate clearly that within the country it was from north to south. There has been nothing yet found in South India in situ in such a position as to claim equal antiquity with stones found at such immense depths as those of the Nerbudda and the Sabarmati. The only example to be named in this connexion is that of Paithan in the Deccan, but over this there was no more than 30 feet of gravel, and the fact that the implement was a flint flake seems to suggest that it did not belong to the very earliest age. Indeed, it is inexplicable to me how an implement of the quartzite age should come to be isolated in the heart of the trap country, which the quartzite men shunned no less than the gneiss; and I suspect that there has been some mistake about the supposed finding of this flint in situ.

Nothing beyond the bare fact of the discovery has ever been published about it, and the evidence of its antiquity may be no better than that of Dr. Noëtling's discovery already criticized. The flake itself, as figured by Quatrefages in his "Introduction to the study of human races" (page 79) might be neolithic. I am disposed on the above considerations to think that the quartzite men entered India from the north-west, and after their first settlements in Rajputana and the rest of North India, turned southward by way of Orissa, always following the quartzite ranges till they arrived at Madras, whence, as already said, they sent out branches west and south. It need not be supposed that they found the country uninhabited: on the contrary, it is quite possible that little hairy brown men, the ancestors of Bhils, Khonds and other unimprovable races of modern India, were then hunting the woods with clubs and pebbles, and were either exterminated where their room was wanted or left alone where there were no suitable stones to tempt invasion.

What manner of body these quartzite men had cannot be known, for nature shows no tenderness to the brittle bones of mankind, and we shall always know more about mastodons than about our ancestors. But it is clear from their stones that they were intelligent and had a variety of needs. Before speculating on the uses of the stones it is as well to realize in a general way what the state of the makers must have been. They were of course hunters living principally on flesh, including no doubt that of their own kind when necessary, with fruits and roots for vegetables. Having no pots, they must have eaten their food raw, and probably had little use for fire. Undoubtedly they went naked, for even in the cold climate of Europe in the later cave period the human figures on bones are always depicted unclothed as the Andamanese are now. Yet they must have had some use for skins as the scrapers show. Since many apes which have never thought of clothing themselves erect shelters, I am inclined to think

that the skins were used rather for this latter purpose than for the body. Clothing indeed would have been the merest nuisance to a hunter in India; but when caves were not available, shelters would have been a comfort in the monsoon. Skins would also be useful to lie on.

Coming now to the stones, I am of opinion that with one possible exception they were primarily implements as distinguished from weapons, and that man made them, not to aid him in hunting, still less in fighting, but to prepare his food and skins, and to cut his clubs. The possible exception is the discoid oval, which might possibly have been meant for throwing at ground game with the motion of a boy who makes stones skip on the water. But I think it more probable that these were intended for smoothing skins with the flat side while the hand grasped the ridge on the other. No doubt the old hunters threw stones as well as "throwing sticks," the parent of the boomerang, at game they were pursuing or had surrounded; but there was hardly need to chip stones for the purpose, or if chipping had been resorted to to give an edge, we should have expected ridges to be left on both sides to improve the flight. The invariable absence of an underridge is against the theory that the disks were sling-stones as has been suggested, apart from the doubt whether the palæolithic men had advanced to this point. But even if the idea of using withes or strips of skin for propelling stones had occurred to them, we do not find that men of later age who used slings took the trouble to fashion the missiles. David simply selected pebbles from a brook, and he is not likely to have been behind the naked savages of the pleistocene in ingenuity. Still less was the savage likely to waste his time chipping stones which were almost certain to be lost whether he hit or missed. I take it that the men of the age we are dealing with reckoned on craft rather than missiles for securing their game, and knocked over small game with sticks or common stones at short distances, while big game was surrounded or caught in

pits and beaten to death with clubs of wood or big bones. As for war in those days, it was probably never more than a rough-and-tumble with clubs whenever two bands happened to meet in the same hunting ground. For fights at home, of course, anything handy would be used, but I imagine that no provision was made for this.

Such a pointed stone as is shown in Fig. 1* might undoubtedly have been an effective weapon; but who can imagine a naked man encumbering himself with a load of such weight whether going out to hunt or to fight? It is very much more likely that these stones were used to dig in the ground near the camp for roots or burrowing animals, or to uproot saplings, etc. I am inclined to think that many of this type which have the butt apparently chipped have been so chipped by hammering the stone to drive it into something. There was, of course, occasion for making holes in skins if they were used for shelters, both to insert creepers for tying them to trees or posts, and to peg them to the ground against wind and rain. To drill a hole with a stone in the skins of some of the animals contemporary with palæolithic man would have required much hammering.

The pointed ovals of the Bhutra type are somewhat of a mystery, but I should connect them with skinning and cutting flesh. The point was useful for the first incision, but every part of the stone could be used to cut and tear when the man had his hands well in the carcass. They must also have been used to divide joints and break small bones, for the points are often worn or broken; and they may have been hammered for this purpose to the chipping of the butt even when it had been originally left smooth.

The scraper was obviously for scraping hides clean, while the disks may have been used to rub them smooth.

The chopper, as I have already said, was no doubt invented to cut branches of trees for clubs and to cleave the

* Ante.

bones of big animals for marrow. It was too heavy for use in hunting or war until it took the neolithic shape and size and was hafted with a handle. If one may hang an inference on the single example of the chopper from Spain and the occurrence of implements of quartzite shapes and sizes in Somaliland and South Africa, it might be suggested that the men who came to India were those who had inhabited the shores of the Mediterranean on the European and African sides, whence they may have been driven south and south-east by the pressure of the more northerly folk fleeing from the ice. Archaic shapes of the chopper have been found in Saugor and Bundelkhand, north of the Nerbudda, as well as throughout the Peninsula and there is at least one example from Cape Colony in the British Museum.

Quartzite man lived all round the great trap area south of the Nerbudda, and often so close to it that his implements have come down to us buried under debris derived from that formation ; but I am not aware that any implements of trap to which a high palæolithic age can be attributed have been found in the peninsula, and it is clear that the country in which this formation predominates was as much eschewed as the gneiss by the old tool makers. Accordingly when we find the comparatively small trap area north of the Nerbudda full of implements of that material, a presumption would arise that some other race had had the making of them, and this is confirmed by the dissimilarity of the quartzite and trap stones in size and style, and the predominance in the latter of shapes tending towards the neolithic. Still, as already hinted, the trap users might have been a branch of the quartzite race driven in late times to the use of a new material unsuitable to quartzite forms, and therefore evolving new types, such as the ground celt, for which the material was more suitable. The question is one of the highest interest in connexion with the theory I broach in the next chapter, that the old river drift men of Europe, and the quartzite men of India, were branches

of the white race, while the cave men of the Solutrian and Madelaine periods belonged to the yellow, and were invaders and conquerors. For if the neolithic types were evolved by the quartzite men, then in the neolithic conquest of Europe the white race was coming by its own again. The theory is seductive, and North India, at a time fifty or sixty thousand years nearer to the glacial epoch than it is now, might easily have maintained in her sons a virility equal to the invasion of Europe. With the trap implements may be associated those of inter-trappean flint, that is, flint derived from trap strata, such as No. 101 of the Museum from Central India, which is a rude oval, blunted at the narrower end and sharp at the other, and No. 100, a scraper from Saugor. Inter-trappean worked flints have also been found in Berar and further south still at Chinoor near the Godavari, and I am disposed to class these and perhaps the jaspers of Bellary which, however, I have not seen since they are not in the Calcutta Museum, with the Marpha age. While the neolithic celts and agates were being evolved in Northern India, or manufactured there by a new race, the quartzite men of the east coast of the peninsula were probably at first little affected, and maintained the old style. But the discovery of foreign chert implements in Madura, just where the quartzite implements stop, proves that in comparatively early times people habituated to flint somewhere else and unwilling to do without it, were travelling far and wide in India; and we may associate these foreign cherts with a migration that travelled from the Nerbudda through Berar and the centre of India, avoiding the quartzite men in the east and passing through their belt at its only open spot, Bellary, and thence proceeding through the gneissic interior of Madras till they hit the end of the quartzite line in Mądura. The discovery of chipped flakes of Jabalpur chert with pottery under the teri in Tinnevelli, shows that these people occupied the country until the latest neolithic times, and kept up communication with the north.

There must have been a chain of settlements forming a trade route through the wild tribes of the Deccan to effect this, and Bellary, in which foreign stone of all kinds was extensively worked, must have been an emporium on this route. The picture thus indicated of comparative peace and security throughout India in the later stone age, is striking and prepares us for the populous civilisation of the pre-Aryan iron age, which has left its relics in innumerable mounds.

CHAPTER IX.

Theories of Quatrefages and Keane—some speculations on the evolution of man and his dispersion—the cave-men of Europe and of India—language no guide to the early movements.

No assured trace of man have been discovered anywhere earlier than the pleistocene age. There has indeed been much wild writing as to discoveries of his bones or work in pliocene and even miocene strata, chiefly by French authors with obviously hazy ideas as to the duration and character of those geological periods. Boyd Dawkins, however, long ago showed the absurdity of the theory of miocene man, and though a pliocene man may not be equally impossible, there is no evidence of his existence worth the name. There are in fact extremely few, and those somewhat doubtful, traces of man even in the early pleistocene: the evidence only becomes clear and incontestable in the mid-pleistocene, some six or seven hundred thousand years ago. But here he springs into light an accomplished chipper of stone tools, and science, which admits no sudden creations, necessarily postulates a predecessor who was not so intelligent or human. Where and when this predecessor originated and how he dispersed himself over the globe are perfectly natural and legitimate speculations, and more than one writer has undertaken them. Thus Quatrefages in his "Introduction to the study of human races" (pages 133, 134) enunciated a "boreal theory" by which man originated in the Arctic regions under the semi-tropical conditions of the tertiary period, and thence dispersed southward before the growing cold. Keane* on the contrary re-floats the Indo-African continent which Wallace† thought

* Ethnology, pages 229—233.

† Island life.

he had effectually sunk, and postulates a pliocene precursor of man who from that centre spread eastwards into India and the rest of Asia, and westwards into Africa and ultimately Europe.

From what has been already said it will be seen that the Indian palæoliths do not carry us much further than we were towards a position from which these theories can be tested. In all probability, as I have tried to argue, the palæolithic men of India were immigrants from Europe, and their works therefore of later date than the oldest of that continent; but even if my arguments on the immigration are disputed, there is no geological ground on which the oldest Indian stones can be made any earlier than those of Europe. So that they do nothing to bridge the great gap between the European stones and the pliocene precursor. What happened before them is still an open field for speculation, and for anything that the stones can say to the contrary, the movements might have been as supposed by either author. The interval between pliocene and mid-pleistocene times is too great to permit us to put any check on man's movements in it when he has left nothing to guide us. We can be reasonably certain that Keane's pliocene precursor and those of his descendants who settled in India at the first did not chip stones, for no chipped stones have been found in pliocene strata; but it cannot be said that India was not full of mere club and pebble savages long before stone-chipping came in. But there is an objection to Keane's theory which seems insuperable, and that is that the Indo-African continent, if it ever existed, had ceased to exist long before the pliocene period. Indian geologists have no doubt always favoured the theory of an ancient land connexion between India and Africa. But Dr. Blanford, the apostle of this doctrine in opposition to Wallace, in his address to the British Association in 1884,* postulated the continent in order to

* Rec. G. S. XVIII, p. 32.

explain the resemblances between the Indian and African fossils of carboniferous to jurassic periods, and Oldham who followed Blanford is quite explicit in the Manual of Indian Geology* as to the beginning and end of this continent. He supposes it to have commenced with the carboniferous period and lasted till the cretaceous, but not beyond, adding: "In the tertiary era we find no further evidence of a land connexion with Africa: at an early period the west coast (of India) was approximately in its present position, and it is probable that at the close of the cretaceous or commencement of the eocene period the great Indo-African continent was finally broken up, and all but the remnants in India and South Africa sunk finally beneath the sea." No hypothesis of islands having survived from the great break up to pliocene times will help the theory, for the precursor would not have developed on islands, and if he had, could not have left them. Indo-Africa thus proves as useless for a cradle of mankind as its predecessor Lemuria proved as a nursery for lemurs. In fact, the Arctic theory of Quatrefages appears to approach more nearly to the probabilities of the case than any which derives man from tropical regions. As Medlicott acutely said: "It is not quite certain that *à priori*, the oldest marks of intelligence that can be called human are to be looked for, as Falconer tells us, 'in the great alluvial valleys of tropical or sub-tropical rivers.' If the analogy of historical times can be taken into account, it would not be under conditions favourable to nakedness and laziness that we should expect contrivance to be born. We may indeed find the monstrous form of the ape in the deposits of tropical regions; but it may be quite possible we should look for the earliest trace of humanity in the regions now most favourable to its development."†

* Pp. 493, 494.

† Rec. G. S., Vol. vi., p. 51.

That state of mind is fatal to a proper comprehension of man's evolution which regards his simian ancestors as large and powerful apes, and in order that monogamy and the modern family may be taken back to the root of society, gives this ape the isolating habits of chimpanzees and gorillas.* Had our precursors been such, such they would have remained, merely adding another ape to those now existing, or they would have become extinct with dryopithecus and a score of other anthropoids. Our precursors obviously developed beyond the other apes because they were extremely unlike them in some ways, and one of these was evidently their high gregariousness. This implies smallness and comparative weakness, for which co-operation was their compensation. We may therefore picture our precursors as short brown apes, no bigger than the African pigmies and probably not very brutal in face, living in companies as large as their means of subsistence would allow, and endowed with the primary virtues of courage, co-operation and obedience to a leader, but not necessarily with anything else that we should call virtue. These habits and qualities must have been developed to meet the attacks of the fearful carnivora, and the competition of the great apes, of their time, and therefore though of course they lived on fruit and vermin like other apes, they could not have been very arboreal. They may have had an equatorial domicile at this stage of their existence, though if so, it is not clear why some of them should not be there still; but for their further development into creatures using tools, and finally into palæolithic men, a complete though gradual change in their mode of life seems a necessary condition. Such a change would be effected by an alteration of climate which drove them from fruit to meat as the principal article of their diet. The evolution must then have taken place in the northern hemisphere, and

* Keane, Ethnology, p. 9; Letourneau, Ev. of Marriage, p. 54.

if so, then most probably in Europe and North Asia. The physical conditions may, indeed, have been equally favourable in North America ; but there are no indications that man originated there.

The fact of our happening to live in the closing stage of a glacial epoch is apt to obscure our perception of the normal capacity of the northern hemisphere as a nursery of life. The present climate of Europe is geologically abnormal and exceptional. So far as appears, there have been only two occasions in the long history of the earth when Europe was cold : the first being the glacial epoch between the carboniferous and permian periods, and the second the glacial epoch which began in the pliocene period and is now passing away. Except for these two interruptions Europe has apparently always been semi-tropical, and in miocene times was covered with palms and a vegetation resembling that of India. There is, therefore, no reason why the ape I speak of should not have originated and lived exclusively there, along with pliopithecus and dryopithecus and all the other European apes of which the miocene is called the reign. If he was living there from the beginning we are saved the trouble of bringing him from elsewhere to meet the cold which was to change his destiny. This cold came on very slowly in the pliocene period, and ended by exterminating or driving out the other apes as it changed the vegetation ; and if our precursor stayed on, it was because he had had the wit to change his food. The hunting of animals will not develop intellectual qualities where the hunter can rely on his own strength and swiftness to hunt alone ; but hunting in packs develops much intelligence, as in the wild dogs, and much higher degrees of intelligence might arise from the hunting in company of creatures not specialised for the purpose, but relying for success on craft and the use of tools. And with an ever-increasing cold constantly multiplying difficulties by

driving the hunters more and more to rely on meat, while at the same time diminishing the supply, the wits would never be allowed to rust or the evolution to stop till the point was reached where the ape had become man and the master of his fate irrespective of the limitations which nature puts on every other animal. That we shall ever find traces of this man in his first period is doubtful, and most so if the evolution took place in Europe or North America. His small bones would have but a poor chance of survival in any case, and least of all with an ice-sheet coming later on to grind all the upper strata into barren boulder clay. But possibly some small parcel is lying in an unexplored pliocene cave. Other traces than bones are hardly to be expected, for ages would elapse between the time when man was merely using broken branches and rough stones, and the time when he began to chip the stones for household use. I have already shown, and I believe it is generally agreed, that the oldest palæoliths had no use in the operations by which man secured his prey ; and horde after horde may have left the ancestral home in the earliest ages and wandered off to people the rest of the world no worse equipped for their life than those they left behind to develop into stone-chippers. It is certainly probable that at least the ancestors of the negritoes and other pigmy races, of the negroes and of most of the other unprogressive races of mankind had left before chipping of the European type was invented ; and that this art in fact was only brought to perfection by the ancestry of the nobler races when long continued residence in the north had greatly improved their faculties. These nobler races must include the yellow as well as the white men ; but the absence of any record of river drift implements in the country of the former suggests that they must have parted from the European stock at a very early age, and started a style of chipping of their own. From the nature of the race, as it is now, we should expect that this style would be artistic ; and nothing

could seem more probable than that the race which introduced the beautiful weapons and drawings of the Solutrian and Madelaine caves were brachycephalic yellow men coming as invaders from Asia. There is evidence that the river drift type of implements is to be associated with the dolichocephalic aborigines of Europe—the presumable ancestors of the white race; and it is easy to assume the association of the later cave type and the brachycephalic races, for brachycephalic people were certainly contemporary with that type in Europe, and there is nothing to contradict the assumption that the men and implements came in together. Boyd Dawkins, indeed, judging by the present art of the tribe, suggested that the dolichocephalic Eskimos are the surviving representatives of the race which introduced the new style; but is it not more probable that these extremely unprogressive folk are merely a fragment of some mixed race, the product of the invasion, who were shouldered aside in very ancient times and have preserved the archaic style of art owing to their isolation in arctic ice? On the other side there is the authority of Pruner Bey, and in some degree of Quatrefages, for the theory that the old brachycephalic people of Europe were of Mongol origin; and it would be strange if this warlike and artistic race appeared in Europe simultaneously with the appearance of weapons of war and pictorial engraving and yet had nothing to do with them.

The race, then, that invented the river drift palæoliths, I take to have been exclusively the long-headed race which inhabited Europe in the earliest times known to us, and which was destined to become the ancestors of the white race, in its three main divisions of Aryans, Semites and Berbers. Some cause, ages before the Mongol invasion, probably the advance of an ice-sheet, caused a southern migration of some part of this race, of which fragments drifted to Somaliland and even Cape Colony, while the

majority reached India and settled there. The settlers in Africa were no doubt in time absorbed by the aborigines or exterminated; but probably a large proportion of the present inhabitants of India have the blood of this race in their veins. The mixtures, however, which must have taken place with the pre-existing aborigines, and with the many races which in the long succeeding ages have entered the country, preclude any hope of distinguishing the ancient type in any particular race. It is hard enough, indeed, to distinguish the Aryans who only came in a few thousand years ago.

The evidence of language which a generation ago was thought all-important in settling the migrations of mankind, will not help at all in the case of movements so ancient as those with which we are dealing. Of this there can be no better illustration than that afforded by the case of the three white races mentioned above. The languages of these races agree among themselves and differ from those of the rest of mankind, in possessing an inflexional structure, and from this we may conclude that none was borrowed from any alien race. But the inflexions have developed along lines as divergent as possible, and the vocabularies are so absolutely different that perhaps not half a dozen words in any one of them can be identified with the words of any other. The physical and mental similarities of the races however contradict the assumption of a very remote separation, and to reconcile the conflict of evidence it seems necessary to assume that till a comparatively recent period of his existence the language of man was almost structureless and mainly vocalic, with but a feeble skeleton of consonants. But if with the races who are pre-eminently in the world the masters of language, speech was in a state of such liquid fusion no longer ago perhaps than a hundred thousand years, it is possible that we have been assuming too great an antiquity for this characteristic of humanity. Sustained speech was not in fact very

necessary to man while as yet he had no leisure for narration and argument, and he may have got on for ages with only a wealth of gestures and vocalic interjections. However this may be, it is clear that if the tongues of the white races who were certainly the last to divide have diverged so widely, language can give us no clue to the home of the quartzite men, and will probably help little in the case even of the later mesolithic invaders if it should turn out that India suffered a like invasion with Europe. In this latter case affinities would have to be sought with the tongues of the mongoloid races. But it must be noted that the mesolithic invaders of Europe lost both their language and individuality among the indigenous population; and it is quite possible that the same thing happened in India.

If in this chapter I have travelled into regions far behind the boundary of the stones, it was to get a true and distinct horizon for the old stone-chippers. To me they are not the misty shapes of an extinct race, but the figures of our own forefathers standing in subdued light, but clearly enough and at less than the middle distance, against an unmeasured background of darkness. The recesses of this background cannot yet be penetrated except by speculation, but it seems certain that the men who emerge from it were much further from the human beings in its remotest abysm than they are from us who look on the picture. They and we are all of a piece. In the interval between the first and last stone implements there were no doubt conquests and migrations when one or other branch of the great stone-chipping family made an advance in art which gave it an advantage over its neighbours: but there is no basis for the theories which imagine a wholesale disappearance of races whenever a new type of implement comes on the scene. Conquerors and conquered being on much the same plane of intelligence would amalgamate in those ages as they have done since, and the disappearance of obsolete types would not denote

the disappearance of their makers, but rather the adoption of a new fashion. Hence we may regard the phases of the stone age as a history in which we are all interested, because it is that of our ancestors and is connected with our own by an unbroken sequence.

THE END.

APPENDIX.

CHIPPED IMPLEMENTS AND FLAKES OF THE CALCUTTA MUSEUM, CLASSIFIED BY LOCALITIES.

NOS. IN REGISTER.	MATERIAL
Kistna and Nellore	
195, 527—532, 538, 539, 541, 558, 671, 675	Quartzite.
Chingleput and Arcot.	
191, 192, 407—444, 446—458, 462—479, 481—525, 533—537, 544—551, 553—557, 561—670, 717—727, 743—776 ...	Quartzite.
459—461	Trap.
Cuddapah.	
728—742, 5644—5843	Quartzite.
715	Trap.
Karnul.	
676—685, 688—693	Quartzite.
Southern Maratha Country.	
193, 194, 201—205, 208—220, 222—248, 250—294, 348—366, 368—405, 542, 543, 552, 697—701, 703—714, 778—796, 798—801	Quartzite.
198—200	Limestone.
206, 207	Vein Quartz.
249, 295	Trap.
Bellary.	
298—302, 308, 310, 334—337, 342 ...	Trap.

CHIPPED IMPLEMENTS AND FLAKES OF THE CALCUTTA MUSEUM, CLASSIFIED BY LOCALITIES—(*contd.*)

NOS. IN REGISTER.	MATERIAL.
Berar.	
35, 36, 38, 40—42	Inter-trappean flint.
37, 39...	Quartzite.
Nizam's Dominions.	
1, 2, 5, 6, 10—16, 18, 19, 21, 22, 24, 25, 27—29	Quartzite.
3, 4, 7—9, 17, 20, 23, 26	Vein Quartz.
197, 694, 696	Trap.
Godavari River.	
34, 45	Inter-trap flint.
30—33, 43, 44	Quartzite.
55	Flint.
Nerbudda River.	
171, 172	Vindhyan Sandstone.
Bundelkhand and Rewah.	
46, 102, 103, 105—111, 118, 120, 122—131, 150	Vindhyan Sandstone.
104	Inter-trap flint.
119, 133—143, 146	Trap.
121, 132, 145	Quartzite.
Saugor and Damoh.	
89—99, 112—117, 158	Vindhyan Sandstone.
100	Inter-trap flint.
154	Gneiss.
157	Quartzite.
155, 156, 159, 160	Trap.
Banda.	
65, 1949—2103	Trap.
Lower Bengal and Orissa.	
49, 53, 54	Quartzite.

CHIPPED IMPLEMENTS AND FLAKES OF THE CALCUTTA MUSEUM, CLASSIFIED BY LOCALITIES—(*concld.*)

NOS. IN REGISTER.	MATERIAL.
Central India Agency.	
101	Inter-trap flint.
170	Quartzite.
Rajputana.	
161—166, 168, 169	Quartzite.
167	Vindhyan Sandstone.
Obscure Localities of Madras.	
528—531, 554, 555, 559, 562, 685—687, 716, 1031—1035, 1754—1761 ...	Quartzite.
CHIPPED FLAKES.	
(Jabalpur.)	
180—182, 185—187, 1040—1070, 1571—1693, 1714, 1715	Chert, agate, &c.